



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

BIO-TRESPASS: RETHINKING PROPERTY RIGHTS IN ENGINEERED INDOOR AIR

Maglin M Raja

Assistant Professor (Research Scholar), Department of Law, Dr Ambedkar Global Law Institute, Tirupati, India

Ranjeeta Singhwahiya

Assistant Professor, Department of Law, Bihar Institute of Law, Patna, India

Komal Agarwal

Assistant Professor, Department of Law, Dr Ambedkar Global Law Institute, Tirupati, India

Dr Swagatika Panigrahi

Assistant Professor, Department of Law, Dr Ambedkar Global Law Institute, Tirupati, India

ABSTRACT

The proliferation of engineered indoor air microbiomes in commercial real estate, curated probiotic bacterial blends circulated through HVAC systems and marketed as health-enhancing amenities, has created a novel and largely unexamined legal problem at the intersection of intellectual property, property law, and tort. Building owners increasingly seek patent protection over these proprietary microbial formulations, yet the diffuse and non-excludable nature of air itself sits uneasily within traditional frameworks of ownership and possession. This paper examines whether existing doctrines, patent eligibility standards for living organisms, trespass to chattels, and conversion, can meaningfully accommodate claims arising when tenants inadvertently carry patented bacteria beyond the premises on clothing, skin, or hair. It argues that conventional property reasoning, rooted in the capacity to exclude and control a tangible resource, breaks down when applied to an environment designed for inhalation and unavoidable bodily contact. The paper further explores contractual attempts to fill this doctrinal gap through restrictive lease covenants, alongside the tension these raise with unconscionability principles, bodily autonomy, and public health disclosure obligations. Situating this emerging conflict within broader debates on the enclosure of biological commons, the paper proposes a framework for distinguishing legitimate innovation protection from overreaching claims of dominion over shared, ambient space.

Keywords: microbial patents, indoor air governance, trespass to chattels, biological commons, property rights in living organisms

Introduction

In fact, commercial real estate has started to think of indoor air as a created product rather than a passive environmental backdrop. Developers of premium office skyscrapers increasingly offer “engineered air,” probiotic bacterial mixtures sprayed through HVAC systems and pitched as decreasing pathogen load and improving tenant wellness. Some building operators have sought patent protection for these microbial formulations, viewing the bacterial makeup of a structure’s air as unique technology, rather than an unintentional outcome of ventilation design.

This prompts theological enquiries across four established streams of jurisprudence. The Supreme Court has determined that a genetically modified, artificially created organism is considered patentable subject matter. However, a subsequent ruling clarified that this protection does not apply to material that has been merely isolated from its natural state. The court ruled that a naturally occurring DNA segment is a product of nature and is not patent eligible simply because it has been isolated. Conversely, synthetic cDNA is patent eligible due to its non-natural occurrence. Read together, an engineered bacterial consortium may satisfy eligibility, but only as to the formulation itself, not the ambient air into which it is released.

The doctrine of trespass to chattels, which was created in digital contexts, is the closest approximation to the concept of incidental interference with property. According to this doctrine, trespass to chattels occurs when a defendant intrudes into the property of the plaintiff in such a way that damage is caused. The scope of the law was eventually expanded to include interference with or use of the personal property of another individual, even in the absence of serious interference. Both holdings turn on the defendant's intentional act, an element absent when a tenant unknowingly carries bacteria out on clothing.

One court ruled that there is no property right to human fluids once they are withdrawn from the body, and a patentable cell line is legally distinct from the raw material from which it was formed. Lastly, the Supreme Court has determined that a landowner's domain encompasses lower altitude airspace but does not extend indefinitely upward, thereby rejecting any absolute claim to air as a resource concerning the enclosure of shared airspace.

This paper poses three enquiries stemming from this precedent: does a patent claim on a bacterial formulation endure once released into the communal atmosphere; does incidental bacterial transfer amount to trespass or conversion in the absence of tenant intent; and can contractual covenants legitimately address these doctrinal voids without invoking unconscionability or infringing on bodily autonomy constraints? The examination is theoretical rather than empirical and does not evaluate the scientific effectiveness of modified microbiomes.

Conceptual Framework

A. Defining Engineered Indoor Air Microbiomes

The innovative approach is based on the intentional introduction of selected, non-pathogenic bacterial strains into a building's ventilation system. These strains are then continually released through the HVAC ductwork to colonise surfaces and airflow within the facility. Compared to this, passive air filtration or purification—which only involves removing pollutants—is significantly different. Here, the building manager deliberately introduces a custom-made biological product into the space, one that is engineered to live and interact with the microbiomes of the people who live there. What the owner wants to keep safe is the formulation—the exact bacterial strains, their ratios, and any genetic alterations. Once the asset is dispersed, it becomes an inherent part of the building rather than a contained substance.

B. Air as a Legal Resource: Non-Excludability and Its Limits

Property law has traditionally regarded air as a quintessential resource that cannot be excluded, one that cannot be owned in the conventional sense required for ownership claims. This treatment is founded on both practical and doctrinal principles. Air is a fluid, invisible force that dances around us, effortlessly mingling and flowing, impossible to contain from those who draw it in. Doctrinally, common law moved away from the ancient *ad coelum* principle that landownership extended infinitely upward, embracing instead the idea that airspace rights are defined by actual use and occupation. Indoor air actively engineered and confined within a building's HVAC system is more contained and clearly 'improved' by proprietary intervention, but every occupant must breathe it to occupy the space, raising the question of whether any degree of enclosure can convert a shared, inhaled medium into a private one.

C. Distinguishing Chattel from Ambient, Adhered Biological Matter

Trespass to chattels and conversion theories were developed around tangible or unambiguously bounded property, a physical thing, a data packet, a tract. This paradigm no longer holds true after the engineered bacteria escape the HVAC system and end up on a tenant's skin or clothing. Here the bacteria are neither inside any discrete thing that the renter has taken, nor are they merely "removed" in the sense of an intentional act. They are passively adhered to without the knowledge, desire, or ability of the tenant to oppose the transfer. That makes the fact pattern dissimilar from law involving computer systems where the defendant's purposeful access or use was at the core of liability. The lack of intent, along with the passive and incidental characteristics of the transfer, represents the primary doctrinal challenge that this paper examines.

D. Introducing "Bio-Trespass"

In this paper, the term "bio-trespass" is employed to denote the evolving category of dispute in which a property owner claims a proprietary interest in engineered biological material that has departed the owner's premises and is now affixed to a third party's body through ordinary occupant movement. Bio-trespass is situated at the intersection of the exclusion requirement of property law, the possession-based remedies of tort law, and the product-focused protections of patent law. None of these legal frameworks can independently accommodate a living, adherent, unconsented biological transfer. In subsequent sections, each doctrinal lens is individually examined before a framework is proposed to address the disparity.

Literature Review

A. Biotechnology Patents and Living Organisms

The present doctrinal underpinning of scholarship on the patenting of biotechnology is contained in *Diamond v. Chakrabarty*, which held that created life forms that do not occur naturally in nature are patentable subject matter. Subsequent analysis of *Association for Molecular Pathology v. Myriad Genetics* has emphasised the demarcation established by the ruling between discovery and invention, highlighting that the Court's differentiation between isolated and synthetically modified genetic substances aimed to inhibit patentees from asserting ownership over natural products simply by extricating them from their native environment. The conceptual ceiling that applies here is established by this literature: protection is attached to the designed formulation rather than the natural or ambient medium into which it is inserted. However, none of this research considers a situation in which the patented biological product is intended to be continuously released into a shared, inhaled environment. This leaves open the question of how the discovery-invention boundary applies once the formulation is purposefully diffused rather than contained.

B. Property Theory on Commons and Non-Rivalrous Resources

The foundational account of "inherently public property" that Carol Rose provides challenges the assumption that resources that lack clear excludability must inevitably degrade or resist propertization. Rose argues that custom, commerce, and public trust doctrine are all capable of managing shared resources without full private enclosure. Rose's paradigm applies to indoor air, which is engineered by a private actor yet shared by all building residents by necessity of breathing. She suggests that some resources are better understood as places of overlapping, non-exclusive usage rather than candidates for exclusion-based ownership, a tension her study argues applies to engineered air.

C. Trespass to Chattels in Diffuse and Intangible Contexts

The trespass to chattels doctrine was extended to computer networks in cases such as eBay and CompuServe, which resulted in extensive scholarship. Michael Madison's examination of internet access rights contends that the application of the trespass doctrine online by courts was predicated on a "Internet-as-place" metaphor that transferred real-property-style exclusion rights to fundamentally different technical resources. This resulted in a doctrinal inconsistency between trespass, anti-circumvention, and contract-based theories of access. Related commentary has raised concerns about this expansion for extending an intent-based tort to encompass conduct that results in minimal or no actual harm to the chattel, cautioning that a widely applied trespass theory could transform incidental or passive interactions into actionable wrongs. This question reflects the bio-trespass issue: whether a doctrine designed for purposeful, damage-causing interference may accommodate passive, unaware bacterial adherence without altering the tort's primary requirements.

D. Gaps in Existing Literature

None of the examined literature tackles a fact pattern that combines all three features present here: a patentable live organism intentionally discharged into a non-excludable shared medium, which sticks to and travels with a third party without the third party's intent or understanding. Biotechnology patent scholarship addresses engineered organisms but assumes containment; commons theory addresses shared resources but not proprietary biological products; and trespass to chattels scholarship addresses intangible or diffuse interference but requires intentional access or use. This work situates itself at the intersection of three seemingly disparate literatures.

Methodology

This paper uses a doctrinal (black-letter) legal research approach, supplemented by analogical reasoning, to examine a novel and untested area of law. As engineered indoor air microbiomes have generated no litigation or regulation to date, the study relies on legal analysis rather than empirical data, surveys, or statistics.

Primary sources include decisions from the U.S. Supreme Court, state supreme courts, and federal appellate courts & treatises used to verify holdings.

The analysis proceeds by analogy, extending doctrine from digital trespass, isolated genetic material, excised tissue, airspace, and wild-animal possession to engineered, ambient, inhalable biological products across patent, tort, property, and contract law, then synthesising findings into a unified framework. The study is limited to U.S. common law and does not assess scientific, commercial, or public health dimensions.

Patent Eligibility and Its Limits

A. The Baseline Rule: Engineered Organisms Are Patentable

The Supreme Court's ruling in *Diamond v. Chakrabarty* established that a genetically engineered microorganism, which exhibits characteristics that are significantly different from those found in nature, is patentable subject matter under 35 U.S.C. sec 101. This doctrine supports patenting any engineered bacterial formulation, including HVAC distribution. The key point is that eligibility applies only to real human change, not to a naturally occurring organism or mixture of naturally occurring organisms.

B. The Bacterial Mixture Precedent: *Funk Brothers*

The most immediately relevant precedent is not a recent biotechnology case, but *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, a 1948 decision involving patent claims over a mixed culture of root-nodule bacteria. The patentee had discovered that some strains of *Rhizobium* bacteria, which normally inhibited one another, could be coupled in a single multi-species inoculant without loss of efficiency. The Supreme Court invalidated the product claims, stating that the finding that particular strains of bacteria could be combined without adversely affecting each other's qualities was not patentable because it was nothing more than the discovery of a phenomenon of nature. The Court pointed out that the features of inhibition or noninhibition in the bacteria were the product of nature and, as such, not patentable, and that the combination of strains did not produce any new bacteria or any change in the normal functioning of the bacteria but merely convenience in packaging.

Funk Brothers is a designed probiotic combination for HVAC applications. A building operator who merely identifies and combines existing, naturally occurring bacterial strains selected for compatibility and health benefit, but without alteration of their genetic structure, risks the same defect: the "invention" may amount to nothing more than a discovery of a natural, non-inhibitive combination, dressed in a delivery mechanism. Following the *Funk Brothers* case such a claim would be void for want of invention, however commercially sophisticated the distribution system may be.

C. Distinguishing Genuine Engineering from Natural Discovery

Isolating a segment of DNA from a naturally occurring organism does not, according to the decision in *Association for Molecular Pathology v. Myriad Genetics*, constitute an act of invention in and of itself, but cDNA that has been synthetically produced and does not exist in nature is nevertheless considered to be eligible. This rationale implies that a patentable indoor-air bacterial formulation should not simply be a selection of compatible naturally existing probiotic bacteria, but rather involve real change, such as engineered gene expression, or deliberately introduced mutations or synthetic strains. The dividing line under both *Funk Brothers* and *Myriad* is whether the patentee transformed the organism itself, as opposed to merely discovering a suitable technique to combine or deploy it.

D. The Boundary between Product and Environment

While a formulation may pass this threshold, the patent protects the formulation, not the environment it is dispersed in. After release into circulating air, the formulation becomes building ambient. Neither *Chakrabarty* nor *Myriad* covers a scenario in which the creature that is the subject of the patent is purposefully engineered to be released into a place in a continuous and uncontained manner, and all of the residents are required to breathe it in. A structural mismatch is created as a result of this: the exclusivity provision of patent law protects against the unauthorised production, use, or sale of the invention that is being claimed, but it does not protect against the passive and inevitable exposure of a third party to the invention. As far as patent law is concerned, a renter who breaths engineered air or who leaves the building carrying trace germs is not "using" the protected innovation in any sense that the law was intended to regulate.

Property and Tort Doctrine Applied

A. Trespass to Chattels: The Intent and Damage Requirements

The tort of trespass to chattels requires an intentional interference with another's personal property causing dispossession, impairment, or deprivation of use. Early digital-era decisions extended this tort broadly: *CompuServe Inc. v. Cyber Promotions, Inc.* held that trespass to chattels occurs when the defendant intrudes upon the plaintiff's property such that damage results, and *eBay, Inc. v. Bidder's Edge, Inc.* found that conduct amounting to intermeddling with or use of another's personal property is sufficient, even absent substantial interference. The California Supreme Court subsequently refined this expansion in *Intel Corp. v. Hamidi*, determining that an electronic communication that does not harm the recipient's system or disrupt its functioning does not qualify as an actionable trespass to personal property. The court concluded that the tort cannot be established without actual damage, as a fleeting or theoretical deprivation of use is inadequate unless it results in dispossession.

Using this line of authority for bio-trespass, a tenant who unknowingly transports proprietary bacteria out of a building meets neither the intent nor the damage element that *Hamidi* requires. The tenant has no intention of interfering with the landlord's formulation; the bacteria have not been damaged, dispossessed, or rendered unusable by the landlord; and the landlord has full access to the HVAC system and its remaining bacterial stock. According to *Hamidi*'s reasoning, a trespass to chattels claim against a departing tenant would almost certainly fail in the absence of a cognisable injury to the landlord's possessory interest.

B. Conversion and the Limits on Property in Biological Material

A comparable challenge exists in conversion theory requiring a plaintiff to show an ownership or possessory interest illegally exercised over by another. In *Moore v. Regents of the University of California*, the California Supreme Court refused to impose conversion liability on a patient for his own excised cells, concluding that no property right exists in bodily fluids once they are removed from the body, and that a patented cell line is a legally distinct entity from the raw biological material from which it was derived. The court reasoned that biological elements, once isolated from the body, do not fit into normal personal property categories and that expanding conversion liability into this arena could inhibit legitimate biomedical research.

Moore opposes a landlord's conversion claim in the opposite direction from what one might anticipate: if a patient does not retain a property interest in his own excised cells, a landlord's claim to bacteria that have fled the building and adhered to a tenant's body is even weaker. The bacteria were intentionally released into open circulation from the outset; the landlord never had bodily custody of them in the same way that a hospital held custody of Moore's tissue. The courts are unlikely to recognise a more robust property claim in bacteria that a third party never bodily possessed if they are hesitant to recognise property in one's own separated biological material.

C. The Non-Excludability of Air as a Structural Limit

Even setting aside intent and possession, a further structural problem limits any property-based claim: air itself resists the kind of exclusive control property law demands. In *United States v. Causby*, the Supreme Court held that a landowner's domain includes lower altitude airspace but does not extend indefinitely upward, rejecting the ancient common law doctrine that ownership extends without limit into the sky and recognizing airspace as, in substantial part, a public medium. It is already difficult for landowners to assert their right to open airspace over their property lines due to public necessity and use, let alone building owners who want to completely isolate their tenants from germs in the air they breathe. By analogy, it is instructive to consider the landmark decision of *Pierson v. Post*, in which the New York court ruled that one does not have a legal right to a wild animal just because they pursue it; rather, one

must prove possession by real physical seizure or lethal wounding. An example of how diffuse, uncaptured resources resist conventional possession-based ownership claims is Post's unconsummated pursuit, which is more apt than Pierson's actual seizure. This is because a landlord can simply design and release bacteria into circulating air without controlling where those bacteria travel.

D. Synthesis

Collectively, Hamidi, Moore, Causby, and Pierson arrive at a unified conclusion from various doctrinal perspectives: courts routinely refuse to broaden possession-based remedies to encompass diffuse, non-damaging, or unclaimed engagements with a resource, especially when the claimant has not exerted significant control over the particular material in question. A landlord's claim that a tenant has engaged in bio-trespass by inadvertently transporting microorganisms from the property is improbable to withstand scrutiny on any of the four doctrinal frameworks analysed here.

Contractual Workarounds and Their Limits

A. The Turn to Private Ordering

Considering the doctrinal weaknesses present in patent, tort, and property law, a landlord facing the bio-trespass issue may find it more pragmatic to seek a private resolution rather than resorting to litigation. The most direct mechanism available is the commercial lease itself, which includes a restrictive covenant that prohibits tenants from "removing," commercially exploiting, or otherwise interfering with the building's proprietary microbial formulation. This approach presents an attractive initial impression. Contract law does not necessitate the same demonstration of intent, possession, or damage that is required for trespass to chattels and conversion; parties are fundamentally at liberty to establish obligations that exceed those imposed by tort or property law. A covenant of this nature would relocate the entire dispute from the doctrinally contentious areas discussed in Sections IV and V to the realm of contract law, where the focus on enforceability hinges not on the existence of a property interest in nature, but rather on the validity of the parties' agreement to establish one.

B. The Unconscionability Limit

Private ordering is limited by unconscionability concept. The American case of *Williams v. Walker-Thomas Furniture Co.* established that unconscionability might be a contract enforcement defence. The D.C. Circuit ruled that a person that executes an unfair contract without knowing its terms is unlikely to have given meaningful consent, given severe asymmetry in negotiating power and lack of meaningful alternatives. Courts have established that unconscionability occurs when there is no meaningful choice.

When this paradigm is used to bio-trespass covenants, a number of structural flaws are revealed. First, there is probably procedural unconscionability: commercial tenants have virtually no bargaining leverage over standard-form building rules included in a master lease or building manual, especially individual employees who never actively negotiated the lease. Second, considering the nature of the duty itself, substantive unconscionability poses a significant risk. Since the transfer happens passively, consistently, and quietly through regular usage of the room, a covenant limiting the "removal" of bacteria imposes a duty that the renter is unable to carry out. Regardless of the varied subject matter, a contractual clause that requires compliance based on an act the promisor cannot control or even notice has the characteristics of the oppressive terms Williams found problematic.

C. Bodily Autonomy as an Independent Limit

In addition to unconscionability, a bio-trespass covenant faces a more essential constraint grounded in bodily autonomy. In *Schloendorff v. Society of New York Hospital*, Justice Cardozo enunciated the fundamental common law doctrine that every adult of sound mind possesses the right to govern the actions performed on their own body; thus, a surgeon who conducts a procedure without the patient's

consent is guilty of assault and liable for damages. While Schloendorff originated within the realm of medical consent, its fundamental principle that an individual's body cannot be subjected to another's persistent claim of authority without authentic consent naturally applies to a situation where a landlord claims a continuous property interest in bacteria residing on a tenant's skin, hair, or clothing post-departure.

A covenant that restricts the "removal" of proprietary bacteria may transition from a valid limitation on the commercial use of a trade secret to an improper claim of control over the tenant's own body, which serves as the means for that removal. This distinction holds significant importance. A landlord may rightfully prevent a tenant from intentionally harvesting circulated air for resale or reverse-engineering the formulation for a competing product, as this limits actions that the tenant can manage and comprehend. A landlord cannot, in accordance with the principle of bodily autonomy established in *Schloendorff*, regard the tenant's body as a vessel under ongoing landlord authority merely due to the presence of trace bacteria when exiting the premises.

D. A Narrower, Enforceable Alternative

Such constraints do not mean that contractual protection is entirely unavailable. A tightly drawn covenant prohibiting the purposeful, commercial exploitation of the formulation (e.g., a prohibition on the deliberate collection of circulated air samples for laboratory study or for sales) would eliminate both of the problems described above. Such a clause confines action within the tenant's knowledge and control imposes an obligation that the tenant can actually undertake, and does not seek to regulate the tenant's body itself. This narrower drafting approach is the only version of a bio-trespass covenant likely to survive scrutiny under *Williams* and remain consistent with the autonomy principle in *Schloendorff*.

Public Health and Regulatory Interface

A. The Disclosure Problem

Indoor air quality does not exist in a purely private legal space; it is independently subject to public health and occupational safety regulation precisely because occupants cannot practically avoid exposure to whatever is introduced into a building's circulated air. This generates a unique tension that is separate from the previously discussed contract and tort matters: a landlord's desire to safeguard a proprietary formulation as a trade secret may directly clash with regulatory and ethical standards that necessitate the disclosure of substances that individuals in the building are required to inhale merely by occupying the space.

As a general rule, trade secret law allows a company to conceal the exact ingredients of a proprietary product from both its rivals and the general public. However, this safeguard has always presupposed that the product stays under the ownership of the proprietor, being sold or licensed as an individual commodity, rather than being constantly released into the atmosphere that third parties are compelled to breathe. Particularly for those occupants with respiratory disorders, immune sensitivities, or other health vulnerabilities that could be impacted by novel biological exposure, the ordinary reason for secrecy, which is to protect a competitive product from imitation, sits awkwardly against the occupant's independent interest in knowing what they are being exposed to when a formulation is intentionally released into a shared environment. This tension echoes the bodily autonomy concern raised in *Schloendorff*: an occupant's inability to consent meaningfully to an exposure they cannot detect or avoid mirrors the informed-consent problem at the heart of that decision.

B. Regulatory Precedent for Non-Waivable Disclosure

In similar situations, public health law regarding food labelling, chemical exposure in the workplace, and pharmaceutical transparency has typically upheld the public's entitlement to be informed about what they consume or are exposed to. This right is considered a baseline that cannot be bypassed or negotiated away, even when the specific formulation is legitimately proprietary. This illustrates a wider regulatory principle: situations involving involuntary bodily exposure are handled differently than typical commercial confidentiality, as the individual exposed does not have the choice to refuse the product in the same manner that a regular consumer can opt not to buy a product with undisclosed ingredients. A tenant in a leased office space has limited practical options to 'opt out' of the building's air supply.

C. The Pre-emption Question

This tension poses an additional structural question: in the event that building codes or public health statutes mandate the disclosure of substances introduced into circulated air, any private lease covenant or trade secret claim that asserts non-disclosure would likely be subordinate to that regulatory requirement. In principle, private IP protection and public health transparency obligations are not incompatible. A landlord can safeguard the underlying bacterial formulation as a trade secret from competitors while simultaneously disclosing its general composition, health effects, and associated risks to occupants and regulators. However, the public health interest in transparency is likely to prevail when a landlord tries to use trade secret status to evade any disclosure.

Proposed Framework

A. Three Organizing Principles

This paper joyfully provides three guiding principles for addressing bio-trespass issues. These ideas are based on the doctrinal and regulatory analysis that was offered earlier.

In the beginning, patent protection should be provided exclusively to the altered formulation as a separate and contained product. This is in accordance with the reasoning that was presented in the cases of *Diamond v. Chakrabarty*, *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, and *Association for Molecular Pathology v. Myriad Genetics, Inc.* Patent claims should be regarded as not covering the ambient air itself or microorganisms that have exited the HVAC system and attached themselves to an occupant's body or clothing. This view is consistent with the common understanding of patents. The designed innovation is clearly differentiated from natural or ambient distribution, which is beyond the purview of what patent law seeks to protect. This is the clear distinction that can be drawn between all three precedents.

With regard to the second point, tort remedies for unauthorised removal ought to involve the intentional and volitional behaviour as was demanded in the case of *Intel Corporation v. Hamidi*, as well as the concepts of trespass to chattels and conversion, which have traditionally required such activity. In accordance with the purpose criterion established in *Hamidi* and the reluctance to widen possessory property rights to separated biological material, as demonstrated in *Moore v. Regents of the University of California*, passive, unknowing body adherence does not satisfy either of the two torts under consideration. Landlords who are looking for a remedy to the planned and extensive collection of circulating air for competing commercial objectives have a strong case. On the other hand, landlords who are looking for recourse against the unintentional and unknowing exposure of a single tenant do not have a viable claim.

Third, contractual limits should only be permitted if they are clearly aimed to prevent purposeful commercial exploitation of the formulation. They should not be structured as an ongoing property claim over a tenant's body or clothing. This is the only circumstance in which they should be permitted. This strategy is necessary in order to ensure that it can withstand scrutiny under *Williams* and that it is in

accordance with the notion of physical autonomy that Schloendorff acknowledged. Any covenant of this kind must to be limited to behaviours that the tenant is able to simply comprehend and manage.

B. A Disclosure Floor

In addition to these three principles, this paper introduces an exciting fourth safeguard that focuses on regulation rather than doctrine: the mandatory disclosure of engineered air formulations to prospective tenants, current occupants, and relevant public health authorities. This disclosure obligation should serve as a foundational standard that private trade secret claims cannot fall below, reflecting the essential disclosure norms established in food safety and occupational exposure regulation. Landlords would still have the liberty to safeguard their unique proprietary formulation from competitors, yet they would not be able to shield it from the occupants who are required to inhale it.

C. Institutional Implementation

Practically, the framework could be operationalised through commercial building code amendments mandating disclosure of indoor air composition on top of existing ventilation and air quality standards, and through judicial application of the unconscionability and bodily autonomy limits identified in Section VI to any lease covenant that overreaches beyond narrow, intent-based restrictions. Courts acting case-by-case through common law doctrine are ill-suited to require industry-wide transparency requirements, and it is probably the case that legislatures and regulators, rather than courts alone, are the more appropriate institutional actors to set the disclosure level.

Recommendations

Based on the doctrinal gaps identified in this paper, the following recommendations are proposed for legislators, courts, and industry stakeholders:

- 1. Legislative Clarification of Patent Scope** Patent statutes or implementing regulations should expressly clarify that biotechnology patents covering engineered organisms do not extend to claims of control over ambient environments into which those organisms are deliberately dispersed. This would prevent building operators from using patent registration as a basis for asserting broader environmental control than *Chakrabarty*, *Myriad*, and *Funk Brothers* actually support.
- 2. Statutory Non-Liability for Passive Exposure** Legislatures should consider a explicit statutory provision shielding occupants from tort or contractual liability for the passive, unknowing transfer of proprietary biological material through ordinary use of leased premises, codifying the intent requirement *Hamidi* already demands at common law, to preempt speculative bio-trespass claims before they reach litigation.
- 3. Model Lease Covenant Language** Bar associations or real estate regulatory bodies should issue model lease language restricting only intentional commercial exploitation of proprietary formulations, avoiding the broader "removal" language that risks unconscionability and bodily autonomy challenges under *Williams* and *Schloendorff*.
- 4. Mandatory Disclosure Rules** Building codes and occupational health regulations should be amended to require disclosure of any biological agents intentionally introduced into circulated air, treating this as a non-waivable floor consistent with existing food safety and workplace exposure disclosure norms.
- 5. Regulatory Oversight Body** A dedicated regulatory framework, potentially housed within existing building safety or environmental health authorities, should be tasked with reviewing and approving engineered indoor microbiome deployments before commercial use, similar to premarket review processes in other biotechnology contexts.

6. Judicial Guidance for Emerging Claims Courts encountering early bio-trespass claims should apply existing doctrinal limits, the intent requirement in tort, the product-versus-environment distinction in patent law, and the unconscionability and bodily autonomy limits on private contracts, rather than treating this as a novel cause of action requiring new doctrine, at least until legislative clarity emerges.

Conclusion

Existing patent, tort, property, and contract law seldom extends possession-based or exclusion-based remedies to dispersed, unclaimed, or passively obtained biological material, especially without purposeful interference. In this paper, Chakrabarty and Funk Brothers on biological patentability, Hamidi and Moore on trespass and conversion, Causby and Pierson on diffuse resource non-excludability, and Williams and Schloendorff on private ordering over bodily autonomy all point to the same conclusion: the law has repeatedly declined to treat passive, non-volitional, or diffuse interactions with a reso.

Engineering indoor air microbiomes shows a gap between commercial ambition and doctrinal capacity. The law protects the formulation as a product but provides no clear way to maintain control after it is purposely introduced into a shared, inhaled environment that inhabitants cannot avoid. Courts, legislators, and regulators will need to decide whether "bio-trespass" is a genuine, cognisable legal wrong or a category error that misinterprets ambient, unavoidable exposure as discrete, controllable taking that property and tort law were designed to address.

This paper proposes limiting patent claims to the contained formulation, requiring genuine intent for tort liability, narrowing contractual restrictions to what tenants can reasonably control, and imposing a non-waivable disclosure floor to close that gap without abandoning legitimate innovation protection or allowing private actors to enclose a shared, non-excludable resource.

Reference

- [1] Diamond v. Chakrabarty, 447 U.S. 303 (1980)
- [2] Association for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576 (2013)
- [3] CompuServe Inc. v. Cyber Promotions, Inc., 962 F. Supp. 1015 (S.D. Ohio 1997)
- [4] eBay, Inc. v. Bidder's Edge, Inc., 100 F. Supp. 2d 1058 (N.D. Cal. 2000)
- [5] Moore v. Regents of the University of California, 51 Cal. 3d 120, 793 P.2d 479 (1990), cert. denied, 499 U.S. 936 (1991)
- [6] United States v. Causby, 328 U.S. 256 (1946)
- [7] United States v. Causby, 328 U.S. 256 (1946)
- [8] eBay, Inc. v. Bidder's Edge, Inc., 100 F. Supp. 2d 1058 (N.D. Cal. 2000); CompuServe Inc. v. Cyber Promotions, Inc., 962 F. Supp. 1015 (S.D. Ohio 1997)
- [9] Diamond v. Chakrabarty, 447 U.S. 303 (1980)
- [10] Association for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576 (2013)
- [11] Carol M. Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. Chi. L. Rev. 711 (1986)
- [12] Michael J. Madison, *Rights of Access and the Shape of the Internet*, 44 B.C. L. Rev. 433 (2003)
- [13] See discussion of narrowing trend in *Intel Corp. v. Hamidi*, 30 Cal. 4th 1342 (2003) (denying trespass to chattels claim absent physical damage to servers)
- [14] Diamond v. Chakrabarty, 447 U.S. 303 (1980)
- [15] Funk Bros. Seed Co. v. Kalo Inoculant Co., 333 U.S. 127 (1948)
- [16] Association for Molecular Pathology v. Myriad Genetics, Inc., 569 U.S. 576 (2013)
- [17] CompuServe Inc. v. Cyber Promotions, Inc., 962 F. Supp. 1015 (S.D. Ohio 1997)

- [18] eBay, Inc. v. Bidder's Edge, Inc., 100 F. Supp. 2d 1058 (N.D. Cal. 2000).
- [19] Intel Corp. v. Hamidi, 30 Cal. 4th 1342 (2003)
- [20] Moore v. Regents of the University of California, 51 Cal. 3d 120, 793 P.2d 479 (1990), cert. denied, 499 U.S. 936 (1991)
- [21] United States v. Causby, 328 U.S. 256 (1946)
- [22] Williams v. Walker-Thomas Furniture Co., 350 F.2d 445 (D.C. Cir. 1965)
- [23] Schloendorff v. Society of New York Hospital, 105 N.E. 92 (N.Y. 1914)
- [24] U.C.C. sec 2-302

