The Guinea Pigs

The experiment went wrong. The companies will make good in other ways. The effects on the victims remain where they occurred.

Miteni Case No. 1 · Part 3 · The Guinea Pigs: the workers · part two · whitecollarcrimes.it · 30 July 2026

In part two we gave the event its shape: a single volcano with two mouths — Spinetta and Trissino — and a cloud spread through air and water across almost the whole of the North. In part three we introduced the deliberately provocative notion of guinea pigs. What remained was the count no one has finished making: the health reckoning. We begin it where it must be begun, with the most exposed and the least studied — the workers. And we begin it with the same word, guinea pigs, in order to earn the right to use it. It is not an insult and it is not a convenient metaphor. It is the description of a fact — an experiment on human bodies, without consent and without a protocol, whose outcome we now even know. A failure. For the environment and for health. Not for the companies' accounts. Everything that follows rests on a judgment and on the scientific literature, cited one item at a time.

1. Why "guinea pigs"

Every experiment on human beings, from Nuremberg onwards, has a first requirement, before the white coat and the laboratory: the consent of the person subjected to it. Informed consent — that is, given by someone who knows what he is facing. It is the threshold below which there is no science, only abuse. This is why the right word here is guinea pigs: because that threshold was never crossed.

Those who worked at Trissino or at Spinetta did not choose to have their blood loaded with PFOA and then with its successors. Inside the factory little was known, often nothing, of what those molecules do to a human body over the years. Outside the factory — the hundreds of thousands of people who drank the water — nothing at all was known. No one signed a form. No one was able to say no. The question that holds this part together is the one the law has asked for centuries and which here has gone unanswered: by what right does a private party decide to introduce, into the bodies of

tens of thousands of people, a substance those people do not know and which, once it has entered, they will never be able to get out again?

Because this is the trait that makes the experiment irreversible. The human body has no returns desk. What has entered, stays — and we shall see for how long. The laboratory guinea pig, at least, is chosen and is observed. These guinea pigs were neither chosen nor observed: they were only exposed.

2. The experiment and its outcome

An experiment is judged by its outcome. And the outcome, here, is already on the record — we are not the ones writing it, the facts of recent months are.

PFOA — the historic molecule, the one it all began with — was abandoned by industry worldwide after its toxicity and its bioaccumulation in the blood were discovered.[1] In its place came the "successors", presented as safer: at Spinetta and at Trissino, Solvay's cC6O4; at Trissino, for the DuPont supply chain, GenX. They were the promise that the problem had been solved. Let us look at where they have ended up, today.

cC6O4. The company that patented and registered it has announced that it will eliminate the use of fluorosurfactants from all its production globally by 2026; at Spinetta Marengo, by that date, almost 100% of fluoropolymers will be manufactured without fluorosurfactants. cC6O4, by the company's own definition, was a "transition" molecule, today produced only in "limited quantities" while the switch is made to the technology that does without it.[2] In plain words: the firm that created it is setting it aside. One does not abandon what works. The abandonment is the confession — sober, in a press release — that it was not a good idea.

GenX (HFPO-DA). It has been placed on the Candidate List of "substances of very high concern" (SVHC) under the European REACH regulation.[3] And in parallel the proposal for a universal restriction on PFAS is moving forward: the Committee for Risk Assessment of the European Chemicals Agency adopted its final opinion on 3 March 2026, with transmission to the Commission by the end of the year.[4] The molecule presented as the remedy is today among those in line to be banned.

This is the outcome. The two "successors" that were supposed to correct PFOA are, the one, being phased out by the very firm that invented it; the other, on its way to being banned by the European regulator. The experiment — replacing one dangerous molecule with another passed off as harmless — has failed. This is not our assessment: it is the documented trajectory of the two substances.

3. But the volcano had already erupted

If an experiment fails in the laboratory, it is stopped and begun again. Not here. Because the outcome arrived after the exposure, not before. By the time industry and the regulator acknowledge that the successors will not do, the molecules are already in the bodies. The volcano, to take up the image of part two, had already erupted.

And it stays with us. It is the trait that makes PFAS what they are: biopersistence. For PFOA this word has a precise human measure, obtained by studying chemical workers who had retired and were no longer exposed: the half-life in blood is about three and a half years — the time the body takes to clear half of it — and later meta-analyses place it between one and five years, with other molecules of the same family (PFOS, PFHxS) slower still.[5] Years, not days. It means that a dose absorbed in the factory goes on circulating for a decade and more; and that the only rapid route of elimination, for a woman, runs through pregnancy and breastfeeding — that is, through the child.[6]

This is why the late abandonment repairs nothing. A plant can be closed, a technology can be changed, a substance can even be banned: what has already entered the blood of those who were there cannot be recalled. The guinea pigs of the failed experiment carry it in them.

4. The real and the probable effects

Here the piece changes register and becomes a review. Because a word like "guinea pigs" must be sustained with what science has actually measured — distinguishing, honestly, what is established, what is probable, and what remains uncertain.

The established starting point is the international classification: in December 2023 the International Agency for Research on Cancer (IARC) placed PFOA among the substances carcinogenic to humans — Group 1, the same as asbestos and benzene — on the basis of human evidence for kidney and testicular cancer, of animal data and, above all, of a solid body of mechanistic evidence: PFAS induce oxidative stress, depress the immune defences, and alter the response of certain cell receptors.[7] It should be said, in fairness, that part of the regulatory toxicology community has judged that classification too severe: we report it, because an honest review also accounts for those who dissent.[8] But the international benchmark, today, is that one.

Then there are the workers, who are the heart of this part because they are the most exposed and — this is the cruel joke — the least studied. The few occupational cohorts available, small and not recent though they are, say convergent things.

In the United States, the cohort of some 5,800 workers at DuPont's Washington Works plant — with mean serum concentrations estimated at around 350 nanograms per millilitre — showed excesses of chronic kidney disease, of diabetes and of mesothelioma.[9] Again in the United States, among 3M workers exposed to PFOS, excesses of bladder cancer and of cerebrovascular disease in the most exposed group.[10]

In Italy, and this concerns us closely, the cohort of the Trissino workers — 462 men with an internal PFOA burden among the highest ever documented anywhere in the world, on average above 4,000 nanograms per millilitre, with peaks of 91,900 — recorded excesses of liver cancer and of blood cancers (lymphomas and leukaemias), as well as more diabetes and more cirrhosis, and in a measure that rose with the internal dose.[11] In the cohort of the Spinetta Marengo workers, followed to 2024, an excess of non-Hodgkin lymphoma: the authors attribute it mainly to another substance made at the plant, tetrafluoroethylene, and we report this too, because the precise attribution of the cause is itself part of the method.[12] The meta-analyses that pool several studies confirm the association of PFAS with kidney cancer and, at the highest doses, with testicular cancer.[13]

This is the plane of the established and the probable. The limitation, openly stated, is common to all these studies: small cohorts, wide statistical margins, exposure data that are often incomplete. None of them, on its own, proves the causal link in a single individual. But it is precisely their convergence — kidney, liver, blood, bladder, in different and distant populations — that constitutes the signal. When independent warning lights all come on in the same direction, ignoring them is a choice, not prudence.

To the cancers must be added the non-cancer effects, by now the most studied front. Immunotoxicity — the capacity of PFAS to depress the immune response, measured also as a reduced production of antibodies after a vaccine — is regarded by the European food safety authority as the most critical effect of the entire class.[14] And then the alterations of cholesterol and blood pressure, documented in the Veneto workers too when one looks at the mixture of PFAS rather than at a single molecule;[15] the alterations of the thyroid; the liver indices. The exposed body does not react to one poison at a time: it reacts to all of them together.

5. The successors were no safer

There remains the promise to be tested all the way down: were the "new" PFAS — cC6O4, GenX — really safer? It is the question that counts, because it is to these that the workers of the latest season were exposed. The answer from the literature is cautious but unequivocal: there is no evidence that they are.

The only demonstrated advantage is the shorter persistence in the body: cC6O4, measured in the workers, has a half-life of about eight days, against the years of PFOA.[16] But "less persistent in the body" is not "safer", for two reasons. The first is that in the environment these molecules remain and travel — cC6O4 has been found throughout the Po basin — so that a more rapid elimination is matched by continuous re-exposure: the guinea pig does not receive a single dose, but an old one leaving and a new one coming back. The second, and starker, is that at the biological level the successors do, in large part, the same things as PFOA. In an experimental model cC6O4 altered the very same pathways — immune response, programmed cell death, fat metabolism — to the point where the authors conclude that "replacing PFOA with cC6O4 does not reduce the risks".[17] For GenX, the studies show effects on liver, thyroid, metabolism and development comparable to those of PFOA; on one front, the thyroid, GenX proved *in vitro* to be even more toxic than PFOA.[18]

Behind all this there is a mechanism worth naming without rancour, because it explains a good many "almost incomprehensible situations". A recent study describes the substitution of these ethers for PFOA not as an accident, but as the predictable product of knowledge gaps built in structurally: the tests required to place a substance on the market are not designed to assess its real health risk, and this makes it possible to produce and release for years molecules about which very little is known.[19] It is not an accusation against one company: it is the description, verified by other scientists, of how the system works. The corollary for the workers is stark — anyone handling a successor to PFOA today is exposed to a molecule whose knowledge is owned almost entirely by the producer, and on which no study exists that follows the health of the exposed over time.

6. The guinea pigs waiting to know

And so we come to the point that gives this part its title and that, for us, is the gravest. An experiment, even the most unscrupulous, provides at least that its subjects be observed. Here, not even that.

The cohorts we have cited cover PFOA and the old molecules. Of the two successors — cC6O4 and GenX, the substances to which the workers have been exposed over the past decade — there exists, to date, no epidemiological study following over time the health of those who handled them. And there exists no study of the mixture, that is, of the only thing those bodies actually have inside them: old and new PFAS added together. They are guinea pigs who were given the substance and then had the gaze withdrawn from them. The experiment has a subject and has no follow-up.

And yet the instruments for looking do exist. The United States National Academies of Sciences published, in 2022, a clinical guidance setting out how to measure PFAS in blood

and what to do at rising thresholds — with additional testing and surveillance above certain levels;[20] and it is an established fact that removing the source works, because where the water has been remediated the levels in the population's blood have fallen within a few years. For cC6O4, its own kinetics even suggest the right matrix to check: being rapidly eliminated by the urinary route, it is urine — not blood alone — that tells the story of the exposure.[21] Medicine, in short, would know what to do. What is missing is not the method: it is the decision to apply it to those who have been exposed, while they are alive, before the diagnosis and not after.

This is the sense in which we speak of warning signals left unheeded and of inaction that is not innocent. Not innocent because it is not neutral in its effects: the gap between the first indications that PFOA was dangerous and its formal recognition is measured in decades;[22] the substitution with molecules no better studied repeated the pattern; and what is not measured — because the standard is missing, because the monitoring is missing, because the will is missing — simply is not seen, and what is not seen enters neither science nor a courtroom. To fragment, not to measure, not to follow up: these are the three ways in which a great disaster is kept invisible.

7. What is owed

We close where science, and not polemic, leads. Zero risk is obtained only with zero exposure; and for those who already have PFAS in their bodies zero is unattainable. What remains is a minimum duty towards the subjects of an experiment they did not choose: to study them and to protect them. A multicentre cohort study bringing together the workers of the different sites on the same molecules — including the new ones —, a harmonised biomonitoring programme (blood and, for cC6O4, urine), and health surveillance for those who are alive, today. It is the least that is owed to those who carried first, in their own blood, every molecule before anyone decided whether it was safe.

The experiment has failed: the abandonment of one substance and the banning of the other say so. But its guinea pigs are still here, and they are waiting for one thing only — to know what was done to them.

The workers, however, are only the first rank. Behind them there is one far more numerous, and less aware still: the populations that had the misfortune to live beside the direct sources of the exposure — up against the factory, under the plume of the chimneys, or downstream of a poisoned aquifer. Those who worked there at least knew they were inside a chemical plant. Those who lived round about drank, breathed and grew their food without suspecting anything, and for this reason theirs is the condition of the guinea pig in its purest form: exposed without knowing it, for the sole fact of having been born

in a certain place. It is to them — to the dead and the sick among the population of the two epicentres, and to what remains today in their blood — that the next part is dedicated.

A note on sources and method

We distinguish, as always, three planes. Established: the facts on which the judgment of the Vicenza Court of Assize no. 1/25 rests (ownership of cC6O4 and of GenX, the production cycles, the concentrations) and the data of the peer-reviewed scientific literature cited here (the IARC classification of PFOA, the occupational cohorts, biopersistence, the kinetics of cC6O4). Stated: the corporate and regulatory announcements on the phasing out of fluorosurfactants and on the status of GenX, as reported by their respective sources. Inferred: the overall reading — the experiment without consent, the failed outcome, the duty to study and protect the exposed — which is the thesis of this investigation, not a judicial finding. The Miteni managers have been convicted at first instance; the position of the upstream producers remains the subject of the criminal complaints filed with the Public Prosecutor's Offices of Alessandria and Vicenza. On the health plane none of the sources proves, on its own, causation in a single individual: it is the overall picture that guides the risk assessment, and where the scientific community is divided we have said so. The court records not covered by secrecy will be published alongside the investigation.

Notes

1. Replacement of PFOA after the discovery of bioaccumulation and toxicity: Judgment of the Vicenza Court of Assize no. 1/25, pp. 42-44 (from 2000, after the United States restrictions and "the DuPont case", industry replaces long-chain PFAS with perfluorinated oxo-acids, among them HFPO-DA and C6O4).

2. Phasing out of fluorosurfactants: Solvay, press release "Solvay to phase out use of fluorosurfactants globally"; Syensqo factsheet on C6O4 (a "transition" molecule towards *non-fluorosurfactant* technologies, today in "limited quantities" at Spinetta Marengo); by 2026 almost 100% of fluoropolymers at Spinetta will be produced without fluorosurfactants (company sources, 2024-2025). *Status:* stated (company communications).

3. HFPO-DA (GenX) placed on the *Candidate List* of substances of very high concern (SVHC) under the REACH regulation (ECHA). *Status:* established (regulatory act).

4. Proposal for a universal restriction on PFAS: ECHA's Committee for Risk Assessment (RAC) adopted its final opinion on 3 March 2026; the committees' opinions will be transmitted to the European Commission by the end of 2026 (ECHA). *Status:* established (regulatory process under way).

5. Serum half-life of PFOA in workers: Olsen et al., "Half-Life of Serum Elimination of PFOS, PFHxS and PFOA in Retired Fluorochemical Production Workers", *Environmental Health Perspectives*, 2007

(PFOA ~3.5-3.8 years; PFOS and PFHxS longer). Meta-analysis: Rosato et al., "Estimation of PFAS half-lives in human studies", *Environmental Research*, 2023 (PFOA from ~1.5 to ~5 years). *Status:* established.

6. Determinants of half-life and the maternal-foetal route of elimination: Li et al., "Determinants of serum half-lives for perfluoroalkyl substances", *Environment International*, 2022. *Status:* established.

7. Classification of PFOA as carcinogenic to humans (Group 1) and of PFOS as possibly carcinogenic (2B): IARC, Monographs vol. 135, December 2023. Mechanisms (*key characteristics*): Temkin et al., "Application of the Key Characteristics of Carcinogens to PFAS", *Int. J. Environ. Res. Public Health*, 2020. *Status:* established.

8. Critical position on the IARC assessment: Drury et al., "Understanding IARC's PFOA and PFOS carcinogenicity assessments", *Regulatory Toxicology and Pharmacology*, 2024. *Status:* stated (a scientific opinion to the contrary, reported for completeness).

9. DuPont cohort (Washington Works): Steenland & Woskie, "Cohort mortality study of workers exposed to perfluorooctanoic acid", *American Journal of Epidemiology*, 2012 (kidney disease, diabetes, mesothelioma). *Status:* established.

10. 3M cohort (PFOS exposure): Alexander et al., mortality and cancer incidence study of workers in perfluorooctanesulphonyl fluoride production, *American Journal of Industrial Medicine*, 2024 (excesses of bladder cancer and cerebrovascular disease in the most exposed group). *Status:* established.

11. Trissino cohort (Miteni): Girardi & Merler, "A mortality study on male subjects exposed to polyfluoroalkyl acids with high internal dose of perfluorooctanoic acid", *Environmental Research*, 2019 (462 workers; geometric mean serum PFOA ~4,048 ng/mL, maximum 91,900; excesses of liver cancer and of lympho-haematopoietic cancers, of diabetes and cirrhosis, with a dose-response relationship). *Status:* established.

12. Spinetta Marengo cohort: Consonni et al., mortality study of the workers of the fluoropolymer complex, 1960-2024, *Occupational and Environmental Medicine*, 2026 (excess of non-Hodgkin lymphoma, attributed mainly to tetrafluoroethylene). *Status:* established.

13. Meta-analysis on kidney and testis: Seyyedsalehi et al., "PFAS Exposure and Risk of Kidney, Liver, and Testicular Cancers: A Systematic Review and Meta-Analysis", *La Medicina del Lavoro*, 2023. *Status:* established (synthesis of several studies).

14. Immunotoxicity as the critical effect: EFSA, 2020 opinion on the group of four PFAS (reduced antibody response to vaccines as the most critical effect); Ehrlich et al., "Consideration of pathways for immunotoxicity of PFAS", *Environmental Health*, 2023. *Status:* established / assessment by a competent authority.

15. Cardio-metabolic effects of the mixture in the Veneto workers: Batzella et al., "Perfluoroalkyl substance mixtures and cardio-metabolic outcomes in highly exposed male workers", *Environmental Research*, 2022 (higher cholesterol and blood pressure; cardiovascular surveillance of the exposed recommended). *Status:* established.

16. Kinetics of cC6O4 in humans: Fustinoni et al., "Kinetics of Excretion of the Perfluoroalkyl Surfactant cC6O4 in Humans", *Toxics*, 2023 (half-life ~8 days; elimination mainly urinary). *Status:* established.

17. cC6O4 and the biological pathways of PFOA: Bernardini et al., "The new PFAS C6O4 and its effects on marine invertebrates", *Environment International*, 2021 ("replacing PFOA with cC6O4 does not reduce the risks"). *Status:* established (experimental study).

18. GenX (HFPO-DA): Blake et al., "Maternal, Embryo, and Placental Effects following Gestational Exposure to PFOA or HFPO-DA (GenX)", *Environmental Health Perspectives*, 2020; Conley et al., *Environmental Health Perspectives*, 2019; thyroid toxicity *in vitro* greater than that of PFOA: Zhang et al., *Environment International*, 2021. *Status:* established (experimental studies).

19. "Regrettable" substitution and structural knowledge gaps: Cordner et al., "Regrettable for whom? GenX chemicals as a case study in detrimental chemical substitution", *Environmental Science & Policy*, 2025. *Status:* stated (peer-reviewed analysis).

20. Clinical guidance on surveillance: National Academies of Sciences, Engineering, and Medicine (NASEM), *Guidance on PFAS Exposure, Testing, and Clinical Follow-Up*, 2022 (rising serum thresholds with additional testing and follow-up); cf. Bogdan et al., *Environmental Health Perspectives*, 2023. *Status:* established / recommendation by a competent authority.

21. Urine as a biomonitoring matrix for cC6O4: Fustinoni et al., cited (note 16). *Status:* established.

22. The gap between the first indications and the formal recognition of PFOA: Steenland et al., "Evolution of evidence on PFOA and health following the C8 Science Panel", *Environment International*, 2020. *Status:* established (historical reconstruction).

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