

Heavy Metals in Peptides, SARMs, and Research Chemicals

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THE CLAIM

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An unapproved product does not carry the assurance of an approved drug supply chain. Metal testing can address a specific quality question, but cannot establish the product's identity, sterility, efficacy, broader safety, or legal status.

Abstract

Gray-market injectable peptides, oral selective androgen receptor modulators, anabolic-androgenic steroids, and raw powders raise quality-assurance concerns. Unapproved status does not place a product beyond drug law, and a research-use label does not itself remove FDA authority. A product sold outside an approved supply chain cannot be assumed to have demonstrated pharmaceutical quality controls. They are manufactured, in the main, by unregulated overseas synthesis without the purification a pharmacopeia demands, and then sold as powder for a buyer to dissolve at home. The first forensic survey of this market found [lead](#) in every product class it tested and metal loads that, at realistic doses, approach the daily exposure limits set for medicines. This briefing sets out what the published record measures, why an injected or gray-market product is uniquely exposed, why a company that will not stop selling should at least be testing, and how the Heavy Metal Tested & Certified program approaches a class it certifies for heavy-metal safety only. The program does not endorse, approve, or vouch for the efficacy or the legality of these products. It certifies one thing: that the metal content has been measured against a published method and a toxicological ceiling, on every lot.

A gap in quality assurance

ICH Q3D describes risk-based elemental-impurity controls for drug products within its scope, using permitted daily exposures for oral, parenteral, and inhalation routes. USP General Chapters <232> and <233> address impurity limits and analytical procedures. These frameworks have defined scopes and do not universally require testing every lot; HMTc's proposed testing controls are separate program decisions ^{[2][3]}.

FDA identifies SARMs marketed for bodybuilding as unapproved drugs and warns consumers against their use ^[4]. Its warnings also address products advertised for research while being sold for human use. Lack of approval is a quality-assurance problem, not a legal exemption. FDA's separate notices describe counterfeit Ozempic and nonsterile compounded semaglutide and tirzepatide; counterfeiting and compounding are distinct issues, and lawful compounding operates under specific conditions ^[5].

HMTc has not identified a category-specific government concentration limit to adopt for this grouping of gray-market products. That program finding does not establish that the products are exempt from drug law, that no quality requirements apply, or that testing makes them lawful. The question addressed here is whether the metal content has been measured reliably.

What the published record measures

The gap would be hypothetical if the products were clean. The first forensic survey of the market says they are not.

In 2025 an Australian harm-reduction study analysed 28 illicit anabolic-androgenic steroid products, 16 injectable oils, 10 oral tablets, and 2 raw powders, donated anonymously by people who use them, and measured their metal content by inductively coupled plasma optical emission spectrometry against the Q3D permitted daily exposures ^[1]. Lead was quantifiable in every product class. [Arsenic](#) appeared in the injectable and oral forms. The single sharpest finding was [nickel](#): oral products carried a mean of 27.5 µg per gram, a concentration the authors noted could exceed the 200 µg-per-day oral exposure limit depending on how much a person takes. [Aluminium](#) was the heaviest load of all, averaging 651 µg per gram in oral products and reaching 1,220 µg per gram: a metal for which no pharmacopeial daily limit even exists. Alongside the metals, the survey found that more than half the products were mislabelled or mis-sold, and of those with a stated dose only a fraction fell within five percent of the label ^[1]. A market that cannot be trusted to put the right active ingredient in the vial is not a market that can be trusted to keep lead out of it.

The mechanism behind those numbers is not mysterious. Peptide and steroid synthesis uses metal catalysts and metal-bearing reagents; the purification steps that strip catalyst residues down to pharmacopeial levels are expensive, validated, and, in a gray-market operation optimising for yield and price, routinely skipped or absent. Illicit manufacture may evade quality controls required for lawful drug supply; the cited product survey did not audit manufacturing facilities or establish their legal obligations. The final step is often performed by the buyer: a raw powder shipped from an unregulated synthesiser is weighed and reconstituted at a kitchen table, with no analysis at any point between the reactor and the bloodstream. Those possible contamination pathways require investigation; unapproved status does not excuse failures to comply with applicable drug law.

Why the injected route makes it worse

Toxicology treats an injected metal differently from a swallowed one, and the difference is not small. When a metal is eaten, the gut absorbs only a fraction of it; the permitted daily exposures for an oral drug are written around that absorption discount. An injected metal skips the gut entirely and arrives in the bloodstream in full. That is why the pharmacopeial limits fall steeply from the oral route to the parenteral one: the parenteral ceiling for [cadmium](#) is a fraction of the oral, for [mercury](#) a tenth of it, for nickel a tenth again ^{[2][3]}. A concentration that would clear the oral limit can breach the injected one many times over.

This is the route that dominates the class. Injectable peptide hormones, injectable steroids, and the raw powders reconstituted into injectable oils are, per microgram of contaminant, the most severe exposure pathway in the entire product taxonomy the program covers. Aluminium makes the point most starkly. It is the one metal a government does control by the injected route: the Food and Drug Administration limits aluminium in parenteral nutrition solutions to 25 µg per litre because of its cumulative toxicity when the gut is bypassed ^[7], and it is the metal the survey found in the greatest excess. That regulation concerns specified total-parenteral-nutrition products; a research-use label does not itself decide which drug laws apply.

The case for testing, with or without certification

A company selling into this market carries risks it may not have priced. The clearest is liability. A product that injures a user through a contaminant it never tested for is the archetype of a failure-to-test claim, and the absence of any regulatory limit is not a shield: a plaintiff does not need to show a product exceeded a legal ceiling, only that a reasonable manufacturer would have measured what a published method makes measurable. The forensic survey has now established, in the peer-reviewed record, that heavy-metal contamination in this class is foreseeable ^[1]. Foreseeability is the hinge of a duty of care.

The second risk is commercial, and it runs the other way: toward opportunity. This is a market with no quality signal at all. Every product looks the same to a buyer: a vial, a powder, a label that the survey shows is wrong more often than not. A company that can show a credible, independent measurement of what is in its product holds the only differentiator the category permits, in front of a customer base that is, by the economics of the products, able to pay for it. Existing FDA warnings and enforcement already apply to this market ^{[4][5]}. Testing records can document one quality attribute, but cannot remedy an unlawful drug sale.

None of this requires certification. The floor is testing. A company not ready to certify, unwilling to submit to a standard, an audit, or a mark, can still send every lot to a laboratory for the elemental panel, publish or retain the result, and act on it. Heavy-metal testing is a minimum viable safety step that reduces real harm on its own, independent of any seal. The certification exists to make that testing consistent, methodologically sound, and verifiable by a third party; but the underlying act, measure the metal before a person injects it, is available to anyone, and the argument of this briefing is that it should be the baseline expectation of the class, not its premium tier.

The ethics of certifying a class like this

It would be dishonest to present this as a straightforward decision, so it is set out here as the tension it is.

The case against testing or certifying a gray-market drug class is real. A mark, or even a published test result, can be read as a signal of endorsement. The concern is legitimisation: that a heavy-metal certificate makes an unapproved and sometimes illegal product look safer, more legitimate, or more sanctioned than it is, and that in doing so it draws in users who would otherwise have been deterred by the very lack of assurance that testing removes. There is a precedent worry folded into it: that a certifier which sets foot in this market has implicitly conceded that the market should exist, and has taken on a share of responsibility for what the products do. These are not weak objections and they should not be waved away.

The counter-case is harm reduction, and it rests on a fact the objection cannot dissolve: people use these products regardless of their legal status. Anabolic-androgenic steroid use alone has an estimated global lifetime prevalence on the order of three percent, and FDA's warnings document sales of unapproved

products and specific quality failures ^{[4][5][6]}. The population exists, it is not waiting for permission, and its exposure to heavy metals is, on the published evidence, real and unmeasured. Against a backdrop of certain use, the choice is not between a tested product and no product; it is between a tested product and an untested one. Refusing to measure does not reduce the number of people injecting these compounds. It only guarantees that none of them knows what else is in the vial. The same logic underwrites drug-checking services, which test substances a person has already decided to take precisely because abstention is not the realistic alternative, and it is such a service that produced the survey this briefing rests on ^[1].

The way through the tension is to be exact about what is certified and what is not. The Heavy Metal Tested & Certified program certifies heavy-metal safety, and nothing else. It does not test or vouch for whether a compound is what its label says, whether it works, whether it is safe to use in any broader sense, or whether it is legal to sell or possess. It makes no claim that a certified product is a good idea. It draws the line at a single, measurable, consequential attribute, the toxic-metal content, and it protects the public by ensuring that attribute is measured to a published standard for people who are going to use these products anyway. That is the position: not endorsement, not efficacy, not legality, but the reduction of one specific and documented harm.

What HMTc actually certifies

For this grouping, HMTc has not identified a category-specific government concentration limit to adopt. The program therefore describes its own testing control and toxicological reference points. That choice does not establish an exemption from drug regulation.

Every metal in the panel is placed under a control rather than a published concentration cap. The control has three parts: mandatory testing of every certified lot by inductively coupled plasma mass spectrometry to the pharmacopeial procedure, with reflex speciation for inorganic arsenic and [hexavalent chromium](#); a published analytical method, so the measurement is reproducible and auditable; and an escalation rule anchored not to a made-up product limit but to the route-appropriate permitted daily exposure that toxicology already provides: the parenteral limit for injectables, the oral limit for oral products, the most protective of the parenteral and inhalation limits for nasal and sublingual preparations. A result that would deliver a daily dose reaching that toxicological ceiling fails certification; any detection at all triggers a source investigation, because a contaminant present in a synthetic product signals an uncontrolled input. Methylmercury is treated as not material to a class made by chemical synthesis, which has no biological methylation pathway, and any mercury contamination is captured by the total-mercury measurement instead. The permitted daily exposures are used as toxicological reference points, never republished as if they were product-content limits, because they are not.

The literature baseline for heavy-metal occurrence in these products, and the toxicological case for why each metal is worth measuring, is maintained independently at the [Heavy Metal Index](#)^[2]. This program applies those findings to a certification decision; the two are kept editorially separate by design, so that the reference remains a reference and the standard remains accountable to it. The certification says only what it can defend: the metal content of this product has been measured, by a stated method, against a toxicological ceiling, on every lot. For products with uncertain quality assurance, that is the limited measurement this briefing advocates.

Frequently asked questions

▼ Does certifying a peptide or SARM mean HMTc approves of the product?

No. The program certifies heavy-metal safety and nothing else. It does not endorse, approve, or vouch for a product's efficacy, its identity, its broader safety, or its legality. A certificate attests to one measured attribute, the toxic-metal content, tested to a published method on every lot, and makes no claim that using the product is advisable.

▼ Why is there no numeric heavy-metal limit for this category?

HMTc has not identified a category-specific government concentration limit to adopt for this grouping. It instead describes per-lot testing, a published method, and a route-specific toxicological reference.

Unapproved products remain subject to applicable drug law, and a metal result cannot establish lawful marketing.

▼ What does the evidence actually show about contamination?

The first forensic survey of the illicit anabolic-steroid market found lead in every product class tested, arsenic in oral and injectable forms, oral nickel at a mean that can exceed the oral daily-exposure limit depending on dose, and oral aluminium averaging 651 µg per gram and reaching 1,220 ^[1]. More than half the products were also mislabelled. The contamination is consistent with unpurified synthesis, absent good-manufacturing-practice controls, and home reconstitution of raw powders.

▼ Why does the injected route matter so much?

An eaten metal is only partly absorbed by the gut; an injected metal enters the bloodstream in full. Pharmacopeial exposure limits are therefore much tighter for injectable products than for oral ones: a fraction of the oral limit for cadmium, a tenth for mercury and nickel. Injection is the dominant route for this class, which makes it, per microgram of contaminant, the most severe exposure pathway the program covers.

▼ Should a company test even if it will not certify?

Yes. Heavy-metal testing is the floor, independent of any mark. A company not ready to submit to a standard can still send every lot for the elemental panel and act on the result. Testing is a minimum viable safety step that reduces real harm on its own; certification exists to make that testing consistent and independently verifiable, not to be the only way it happens.

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