QUICKSILVER SCIENTIFIC®

MERCURY SPECIATION VS. CHALLENGE TESTING

A BRIEF HISTORY OF CHALLENGE TESTING

In the 1990s, the sensitivity of analytical equipment was not advanced enough to measure ambient (steady-state) blood mercury levels. Challenge or provocation testing was developed, using high doses of strong chemical chelation agents like DMSA and DMPS to "pull" mercury out of organic cellular structures for urinary analysis. While mercury challenge testing was clinically relevant for the time, advances in technology and clinical study have proven challenge testing to be unreliable and even potentially damaging to patients.

A belief existed that metals were shunted out of circulation into tissues for storage to protect delicate organs, and therefore, blood measurements represented only acute exposure, not long-term burden1. The diagnostic premise of challenge testing was to show the lifetime accumulation of stored mercury and other metals, conceptualized as the "body burden" [7].

To fulfill that promise, a challenge agent would have to accomplish at least one of the following two parameters:

1. Enter into all body cavities in which mercury (and other metals) are stored and uniformly draw metals from the tissues in proportion to the amount stored4.

2. Remain in circulation long enough so that metals are proportionately released from tissues, chelated in circulation, and excreted in the urine[4]. The literature clearly demonstrates that neither of these conditions are met via challenge testing[1,4].

The idea that metals are static, or stored, in the tissues is a misconception4. There are a few cases in which some metals are tightly bound to proteins and other cellular structures. However, these cases are the exception and have more to do with individual detoxification defects than fluid dynamics and metals' behavior. Metals are not entirely immobilized in the tissues9,4. They behave in the body as they do in any aqueous environment separated by membranes. Metals migrate and are dynamic, moving from compartments of greater concentration to compartments of lesser concentration[9,4].

Risks and Flaws of Challenge Testing

1. Only total mercury is measured – there is no differentiation between the organic (methyl or meHg) and inorganic (HgII) forms of mercury from different sources and are excreted through different organs[2]. Therefore, no distinction can be drawn regarding the origin of exposure, and the efficacy of excretion cannot be evaluated.
2. The data does not support the hypothesis that challenge testing demonstrates 'the total body burden' of mercury premise[1]. No reliable evidence supports the diagnostic value of challenge testing[7].
3. Lack of standardization in testing conditions, compounds, dosing, and reference ranges leads to unreliable results and interpretation[7].
    a. Different chelating agents have differing strengths, specificity for various metals, and variable absorption and renal elimination[6].
    b. A non-challenged reference range to compare the challenge test does not exist. Therefore, challenge test results may always appear elevated, creating a risk for over-treatment[7].

c. IV vs. oral administration has vastly different pharmacokinetics.

d. The use of adjuncts such as EDTA, glutathione, and glycine vastly changes the test's dynamics and output.

4. Redistribution of mercury into organs and the nervous system has been observed[5].

5. Results can be skewed in patients with renal insufficiency (common in HgII toxicity).

6. Chelating agents have side effects[7].

CONCLUSION

The measurement of mercury in the body and extrapolation to body burden and toxic conditions is a very complex field requiring acute clinical discernment, including integration of patient history, current exposures, symptomology, and effect of comorbidities. Challenge testing no longer serves the evolution of the field of clinical metals toxicity. Adoption of better diagnostic tools is beneficial for both the practitioner and patient.

For more information, view the whitepaper here.

QUICKSILVER SCIENTIFIC'S MERCURY TRI-TEST®

Specificity: The Mercury Tri-Test (MTT) differentiates (speciates) between the two different forms of mercury that exist in the body, methylmercury (MeHg) and inorganic mercury (HgII). These two forms come from different sources, are excreted through different organs, and have vastly different toxicities. This specificity allows the practitioner to identify the source of exposure and evaluate the toxicity level more accurately.

State of the Art Testing: Quicksilver Scientific uses state-of-the-art analytical equipment and patented speciation testing, making ambient (steady-state) blood mercury testing the new gold standard of precision.

Safety: No chelation necessary. The risk of side effects and redistribution of metals is eliminated.

Sample Requirements: The Mercury Tri-Test requires samples of whole blood, urine, and hair.

- Blood: A direct measure of metals in the body
- Urine: HgII excretes through the kidneys[10]
- Hair: MeHg passes through the liver. Hair mercury concentration is proportional to blood methylmercury concentration[10]. Thus, hair is used as a surrogate for bile in the evaluation of liver excretion.

Evaluating Excretion: By identifying the concentration in the blood (the source) and the concentration in the excretion product (the filtrate), the practitioner can determine the organ of excretion (the filter) compared to the average. This allows the practitioner to support excretion pathways as appropriate. If excretion is impaired, detoxification protocols often exacerbate symptoms, commonly called Herx or detox reactions.

Treatment: The MTT refines your treatment protocol, making it more effective, and reduces or eliminates Herx-type reactions. Quicksilver Scientific's detox protocols are safe and effective, using targeted nutrients to upregulate natural detox pathways. The high bioavailability of the liposomal and nano-emulsion products used in these protocols supports rapid and powerful cellular responses and effective detoxification of toxins.

Notable References

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