

# ORGANIC ACID ELEVATIONS AND TOXIC SUBSTANCES ASSOCIATION

Review over 55 references at [MosaicDX.com/resource/how-the-organic-acids-test-provides-insights-into-toxic-exposures](https://mosaicdx.com/resource/how-the-organic-acids-test-provides-insights-into-toxic-exposures)

## Elevations and Association with **Specific** Toxic Substances

| ORGANIC ACIDS                           | ASSOCIATION WITH TOXIC SUBSTANCE                                                                                                                                                                                                                                                              | RELATED TESTS                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Citramalic Acid                      | Reportedly by-product of <i>Aspergillus</i> , as well as some yeasts. <sup>9</sup><br><br>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis. <sup>8</sup><br><br>Chronic exposures to mold can influence how the immune system responds. <sup>53</sup> |  MycoTOX PROFILE<br> Comprehensive Stool ANALYSIS WITH PARASITOLOGY<br> Mold IgE ALLERGY TEST       |
| 2. 5-Hydroxymethyl-2-furoic Acid (HMFA) | Reportedly by-product of <i>Aspergillus</i> . <sup>1</sup><br><br>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis. <sup>8</sup><br><br>Chronic exposures to mold can influence how the immune system responds. <sup>54</sup>                         |  MycoTOX PROFILE<br> Comprehensive Stool ANALYSIS WITH PARASITOLOGY<br> Mold IgE ALLERGY TEST   |
| 4. Furan-2,5-dicarboxylic Acid          | Reportedly by-product of <i>Aspergillus</i> . <sup>2</sup><br><br>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis. <sup>8</sup><br><br>Chronic exposures to mold can influence how the immune system responds. <sup>54</sup>                         |  MycoTOX PROFILE<br> Comprehensive Stool ANALYSIS WITH PARASITOLOGY<br> Mold IgE ALLERGY TEST |
| 5. Furancarboxyl-glycine                | Reportedly by-product of <i>Aspergillus</i> . <sup>3</sup><br><br>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis. <sup>8</sup><br><br>Chronic exposures to mold can influence how the immune system responds. <sup>54</sup>                         |  MycoTOX PROFILE<br> Comprehensive Stool ANALYSIS WITH PARASITOLOGY<br> Mold IgE ALLERGY TEST |
| 6. Tartaric Acid                        | Reported to be a fungal by-product (yeast and molds). <sup>10-12</sup><br><br>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis. <sup>8</sup><br><br>Chronic exposures to mold can influence how the immune system responds. <sup>54</sup>             |  MycoTOX PROFILE<br> Comprehensive Stool ANALYSIS WITH PARASITOLOGY<br> Mold IgE ALLERGY TEST |

## ORGANIC ACIDS

## ASSOCIATION WITH TOXIC SUBSTANCE

## RELATED TESTS

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                         |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9. Tricarballic Acid       | <p>Can be increased by <i>Fumonisin</i> mycotoxins from <i>Fusarium</i> mold, commonly found on corn products.<sup>5</sup></p> <p>Corn is commonly contaminated with glyphosate.<sup>55</sup></p> <p>If mycotoxins are present, they can disrupt the microbiome potentially causing dysbiosis.<sup>8</sup></p> <p>Chronic exposures to mold can influence how the immune system responds to them.<sup>54</sup></p> |  <b>Mycotox</b><br><small>PROFILE</small><br><i>Fumonisin is not on MycoTOX Profile, but other common Fusarium mycotoxins are such as Zearelenone and Enniatin B<sup>56,57</sup></i> |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |  <b>Comprehensive Stool</b><br><small>ANALYSIS WITH PARASITOLOGY</small>                                                                                                             |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |  <b>Mold IgE</b><br><small>ALLERGY TEST</small>                                                                                                                                      |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |  <b>Glyphosate</b><br><small>TEST</small>                                                                                                                                            |
| 10. Hippuric Acid          | <p>Biomarker of toluene exposure.<sup>30</sup></p> <p>Produced from phenylalanine by various gut bacteria.<sup>58</sup></p>                                                                                                                                                                                                                                                                                        |  <b>TOXDetect</b><br><small>PROFILE</small><br><i>Toluene not on panel, measure for body burden purposes</i>                                                                         |
|                            |                                                                                                                                                                                                                                                                                                                                                                                                                    |  <b>Comprehensive Stool</b><br><small>ANALYSIS WITH PARASITOLOGY</small>                                                                                                             |
| 12. 4-Hydroxy-benzoic      | <p>Associated with Paraben exposure.<sup>33</sup></p> <p>Markers associated with dysbiosis.<sup>34,35</sup></p>                                                                                                                                                                                                                                                                                                    |  <b>TOXDetect</b><br><small>PROFILE</small><br><i>Parabens are not on panel, measure for body burden purposes</i>                                                                    |
| 13. 4-Hydroxy-hippuric     |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                         |
| 15. 4-Hydroxy-phenylacetic | <p>Indicates the presence of <i>Clostridia</i> bacteria.<sup>25,26</sup></p> <p>Common causes of <i>Clostridia</i> overgrowth are exposures to glyphosate and organophosphates.<sup>23,24</sup></p>                                                                                                                                                                                                                |  <b>TOXDetect</b><br><small>PROFILE</small>                                                                                                                                        |
| 16. HPPHA                  |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                         |
| 17. 4- Cresol              |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                         |
| 18. 3-Indolacetic          |                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                         |
| 21. Oxalic Acid            | Elevations can be related to ethylene oxide exposures. <sup>32</sup>                                                                                                                                                                                                                                                                                                                                               |  <b>TOXDetect</b><br><small>PROFILE</small>                                                                                                                                        |
| 23. Pyruvic Acid           | <p>Reflective of pyruvate dehydrogenase enzyme function.</p> <p>Enzyme can be inhibited by arsenic, cadmium, antimony, mercury, causing an elevation.<sup>17,20</sup></p>                                                                                                                                                                                                                                          |  <b>Metals</b><br><small>TOXIC + NUTRIENT</small>                                                                                                                                  |
| 29. Citric Acid            | Arsenic can block acotinase enzyme, which converts citrate to isocitrate. <sup>21</sup>                                                                                                                                                                                                                                                                                                                            |  <b>Metals</b><br><small>TOXIC + NUTRIENT</small>                                                                                                                                  |
| 39. Quinolinic Acid        | <p>Comes from Tryptophan metabolism that can cause neuroinflammation.<sup>28</sup></p> <p>Phthalates inhibit the enzyme that allows quinolinic acid (QA) to convert to Nicotinamide, causing an elevation.<sup>27</sup></p>                                                                                                                                                                                        |  <b>TOXDetect</b><br><small>PROFILE</small>                                                                                                                                        |
| 68. Mandelic Acid          | From phenylalanine breakdown and also a major metabolite of styrene. <sup>29,30</sup>                                                                                                                                                                                                                                                                                                                              |  <b>TOXDetect</b><br><small>PROFILE</small>                                                                                                                                        |

## Elevations that can Indicate Toxic Exposure

| ORGANIC ACIDS                               | ASSOCIATION WITH TOXIC SUBSTANCE                                                                                                                                                                                             | RELATED TESTS                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7. Arabinose                                | Indicator of <i>Candida</i> overgrowth. <sup>36,37</sup><br>Mycotoxins and toxicants disrupt the microbiome and intestinal epithelial barrier, and influence the immune system, influencing candida growth. <sup>38-41</sup> | <br> Comprehensive Stool<br>ANALYSIS WITH PARASITOLOGY<br> IgG Food MAP<br>WITH CANDIDA + YEAST                               |
| 24. Succinic Acid                           | Succinate dehydrogenase enzyme, which converts succinate to fumarate, can be directly inhibited by chemical toxicants, mycotoxins, and heavy metals. <sup>42-46</sup>                                                        |  MycoTOX<br>PROFILE<br> TOXDetect<br>PROFILE<br> Metals<br>TOXIC + NUTRIENT<br><i>*Depending on clinical assessment</i>       |
| 33. Homovanillic Acid (HVA)                 | Both metabolites of Dopamine. <sup>15,22</sup><br>Various pesticides can affect dopamine metabolism causing elevated HVA and DOPAC. <sup>22</sup>                                                                            |  TOXDetect<br>PROFILE<br> Metals<br>TOXIC + NUTRIENT                                                                                                                                                          |
| 36. DOPAC (3,4-dihydroxy-phenylacetic acid) | Heavy metals have been associated with elevated HVA. <sup>15</sup><br>Certain mycotoxins from <i>Aspergillus</i> and <i>Fusarium</i> can influence dopamine metabolism. <sup>6,7</sup>                                       |  MycoTOX<br>PROFILE                                                                                                                                                                                                                                                                               |
| 34. Vanillylmandelic Acid (VMA)             | Elevations may result from heavy metal exposure. <sup>16</sup>                                                                                                                                                               |  Metals<br>TOXIC + NUTRIENT                                                                                                                                                                                                                                                                       |
| 58. Pyroglutamic Acid                       | Reflects glutathione (GSH) status. Elevations can indicate insufficient levels or high demand. <sup>48</sup><br>Exposures to toxicants, heavy metals, and mycotoxins all influence glutathione levels. <sup>49-51</sup>      |  MycoTOX<br>PROFILE<br> TOXDetect<br>PROFILE<br> Metals<br>TOXIC + NUTRIENT<br><i>*Depending on clinical assessment</i> |
| 59. 2-Hydroxybutyric Acid                   | Biprodut of homocysteine to cystathionine pathway. Elevations can allude to high demand for cysteine for GSH or methylation defects related to various toxic exposures. <sup>52,53</sup>                                     |  MycoTOX<br>PROFILE<br> TOXDetect<br>PROFILE<br> Metals<br>TOXIC + NUTRIENT<br><i>*Depending on clinical assessment</i> |

