Porphyrias
Sharon E. Jacob, MD, and Hari Nadiminti, MD. (Updated July 2015*)

4,5-Dioxovalerate + L-Alanine
Glycine + Succinyl CoA
Aminotransferase

I. ALA-S
ALA
II. ALA-D
ALADD
PBG
III. PBG-D
AIP

HYDROXYMETHYLBILANE

CEP
IV. UROIIIS
UROGEN III

V. URO-D
5-Carboxyl porphyrin

VI. COPR-O
Dehydroisocoprogen

VII. COPR-OHCP
COPRO III

VIII. FERR
PROT-O
PROTON IX

II. ALADD
PBG

III. PBG-D
AIP

UROGEN I → URO I

PCT/HEP
V. URO-D

UROGEN II
COPROGEN II
COPROGEN I

UROGEN III
COPROGEN III

UROGEN I
COPROGEN I

5-Carboxyl porphyrin

HCP
VI. COPRO-O
HARDEROGREN

ABBREVIATIONS:

ALA-S: aminolevulinic acid synthase
ALADD: ALA dehydratase deficiency
AIP: acute intermittent porphyria
ALA-D: ALA dehydratase
CEP: congenital erythropoietic porphyria
COPR-O: corroporphrin oxidase
COPROGEN: corroporphyrinogen
EPP: erythropoietic protoporphyria
FERR: ferrochelatase
HARDEROGREN: harderoporphyrinogen
HCP: hepatic coproporphyrin
HEP: hepatic erythropoietic porphyria
PBG-D: porphobilinogen deaminase
PCT: porphyria cutanea tarda
PROT-O: protoporphyrin
PROTGEN: protoporphyrinogen
URO: uroporphyrin
UROGEN: uroporphyrinogen
URO-D: urogen decarboxylase
UROIIIS: urogen synthase III
VP: variegate porphyria

MNEUMONICS and TIPS:
4 mitochondrial enzymes: "ALAS, FERRous
OXIDizes" (ALAS, Ferrochelatase, the Oxidases)
AIP & ALADD: Absent skin findings
HCP, AIP, and VP: HAVE acute attacks of ALA, PBG
"No pee pee in EPP" (no porphyrins in the urine in EPP)

KEY:
Roman numerals represent chronological order, starting with ALA-S (rate limiting step enzyme)
Diseases in teal, enzymes in bold.
Light teal indicates mitochondria

ABBREVIATIONS:
### Porphyrias

*Sharon E. Jacob, MD and Hari Nadiminti, MD. (Updated July 2015)*

<table>
<thead>
<tr>
<th>ENZYME DEF</th>
<th>DISEASE INHERITANCE</th>
<th>INHERITANCE</th>
<th>CLINICAL FEATURES</th>
<th>TREATMENT</th>
<th>RBC</th>
<th>URINE</th>
<th>STOOL</th>
<th>FLUORO</th>
</tr>
</thead>
<tbody>
<tr>
<td>I ALAS</td>
<td>ALADD</td>
<td>Al</td>
<td>Rare (&lt; 10 reported cases);sex can mimic AIP &amp; are highly variable; failure to thrive in infant &amp; polyneuropathy in a 63 y/o; r/o exposure to styrene (inhibitor of ALADD)</td>
<td>Acute attacks: Hematin</td>
<td>Proto</td>
<td>ALA/ Copro</td>
<td>ALA</td>
<td></td>
</tr>
<tr>
<td>II ALA-D</td>
<td>Tyrosinemia</td>
<td>Rare (&lt;200 reported cases); onset: infancy: marked photosensitivity (vesiculo-bullous-scarring), increased fragility and ulcers lead to scarring; “weroxof-foaces”, hypertrichosis, erythrodontia; hemolytic anemia; splenomegaly; port wine urine; corneal scarring → blindness; acro-osteolysis; contractures</td>
<td>Sun avoidance, Splenectomy, BMT, β-carotene, transfusions, alphathecopherol</td>
<td>Uro&gt; Copro</td>
<td>Isocopro</td>
<td>Teeth</td>
<td>Urine, RBC</td>
<td></td>
</tr>
<tr>
<td>III PBG-D</td>
<td>AIP</td>
<td>Al</td>
<td>Incidence: 5 / 100,000; women &gt; man (2:1); onset: 18 - 40 y/o; sx sequence: abd colic → psychiatric sx, ie hysteria → peripheral neuropathy; NO SKIN FINDINGS; SAAH (tyrosinemia, urine discoloration; risk Hepatic CA</td>
<td>Glucose load,</td>
<td>PBG</td>
<td>ALA, PBG</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>IV URO-D</td>
<td>PCT</td>
<td>Al</td>
<td>Types: I: Sporadic II: Familial</td>
<td>EIOH elimination, sun protection, Phlebotomy to Hb&lt;10, antimalarials</td>
<td>N</td>
<td>Uro&gt; copro</td>
<td>Isocopro</td>
<td>Teeth</td>
</tr>
<tr>
<td>V UROIS</td>
<td>(Gunther’s)</td>
<td>Al</td>
<td>Rare (&lt; 200 reported cases); onset: infancy: marked photosensitivity (vesiculo-bullous-scarring), increased fragility and ulcers lead to scarring; “weroxof-foaces”, hypertrichosis, erythrodontia; hemolytic anemia; splenomegaly; port wine urine; corneal scarring → blindness; acro-osteolysis; contractures</td>
<td>Sun avoidance, Splenectomy, BMT, β-carotene, transfusions, alphathecopherol</td>
<td>Uro&gt; Copro</td>
<td>Uro&gt; Copro</td>
<td>Copro&gt; Uro</td>
<td>Teeth</td>
</tr>
<tr>
<td>VI COPR-O</td>
<td>HCP</td>
<td>Al</td>
<td>Incidence: 1-4 / 1,000,000; onset; 18-40; similar to AIP but less severe; 30% have skin findings; Hematophilic photosensitivity → blistering, scarring; during attacks urine pink/red; mutation in CPOX</td>
<td>Glucose load, Hematin</td>
<td>N</td>
<td>Copro</td>
<td>Copro</td>
<td></td>
</tr>
<tr>
<td>VII PROT-O</td>
<td>VP</td>
<td>Al</td>
<td>Rare form of HCP; onset: infancy; sx similar to HCP, with jaundice and anemia</td>
<td>Glucose load, Hematin</td>
<td>N</td>
<td>Copro</td>
<td>Copro</td>
<td></td>
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<tr>
<td>VIII FERR</td>
<td>EPP</td>
<td>Al</td>
<td>Common in South Africans; 15-30 y/o; clinically similar to AIP (abd colic, paralysis, psychosis) + PCT skin findings (photosensitivity); mutation PPOX; 624-626 nm band</td>
<td>Glucose load, Hematin</td>
<td>N</td>
<td>Copro&gt; Uro*</td>
<td>Proto&gt; RBC</td>
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</tbody>
</table>
| Buzz words-Diagnostic hints: Blistering associated with PCT, VP, CEP, HCP, HEP. If blistering with normal porphyrin labs, screen known associations with Pseudoprophyria (HD, tanning booths, drug [NSAID, abx, diuretics]). Burning, erythema, without blisters, is seen in EPP or XLDP. No skin findings, AIP or ALADD. Red teeth: CEP or HEP. *Reviewed and updated July 2015: Alina Goldenberg, MD, Elise Herro, MD, Emily deGolian, MD & Sharon Jacob, MD.