Simpson-Golabi-Behmel Syndrome (SGBS) is an X-linked overgrowth disorder characterized by pre- and postnatal overgrowth, minor facial anomalies, skeletal/hand anomalies, genitourinary abnormalities and supernumerary nipples. Patients with SGBS also show an increased risk for development of embryonal tumours, especially Wilms’ tumour. The main gene identified to cause SGBS is called Glypican 3 (GPC3) and is located on the X chromosome (Xq26). Glypican 3 appears to play an important role in embryonic growth by regulating cell proliferation and apoptosis. GPC4 (also located at Xq26) has also been implicated in SGBS.

**GENETICS**

Males normally have only one X chromosome in each cell. If that X chromosome carries the deletion/point mutation in the GPC3 gene, the boy will be affected with SGBS. As a result, males are most often affected. Since females have two X chromosomes, if one X chromosome carries the mutation in the GPC3 gene and the other one does not, the girl will be a carrier of SGBS. Female carriers may have a milder phenotype because of the effect of Lyonization.

Affected males will have carrier daughters since the X chromosome with the deletion/point mutation will be passed from the father to his daughters, and affected males will have unaffected sons, since they will inherit the father’s Y chromosome. If a female is a carrier, her sons have a 50% chance of inheriting the mutation and being affected with SGBS. Her daughters have a 50% chance of inheriting the mutation and being carriers themselves, and may exhibit milder features of SGBS.

**TEST METHODS**

- Quantitative testing of the GPC3 and GPC4 genes to detect large deletions, using MLPA (Multiplex Ligation-dependent Probe Amplification)
- Complete sequencing of the coding region and flanking exon/intron boundaries of the GPC3 gene to identify point mutations

**TEST SENSITIVITY**

GPC3 deletions/mutations have been identified in 40% of SGBS cases.

**WHO SHOULD BE TESTED?**

- Individuals clinically suspected of being affected with SGBS
- Women with a family history of SGBS, to determine carrier status
- Pregnancies at risk due to a family history of SGBS

**POTENTIAL OUTCOMES & INTERPRETATION OF TEST RESULTS**

<table>
<thead>
<tr>
<th>Patient Sex</th>
<th>GPC3 Gene Mutation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>None detected</td>
<td>This result is unable to confirm a diagnosis of SGBS</td>
</tr>
<tr>
<td>Male</td>
<td>Mutation detected</td>
<td>This result confirms a diagnosis of SGBS</td>
</tr>
<tr>
<td>Female</td>
<td>None detected / none detected</td>
<td>Molecular analysis reduces the likelihood that this individual is a carrier of SGBS.</td>
</tr>
<tr>
<td>Female</td>
<td>Mutation detected / none detected</td>
<td>This individual is a carrier of SGBS, may exhibit a milder phenotype, and may transmit a mutation to offspring</td>
</tr>
</tbody>
</table>

**For More Information**


To locate a genetics center near you, please visit the Canadian Association of Genetic Counsellors website at [www.cagc-accg.ca](http://www.cagc-accg.ca) or the National Society of Genetic Counsellors website at [www.nsgc.org](http://www.nsgc.org)

1. Current molecular testing may not detect all possible mutations in the GPC3 gene. A negative test does not rule out the diagnosis of SGBS, or eliminate the possibility the individual is a carrier.

2. Test results should be interpreted in the context of clinical findings, family history and other laboratory data.

3. This test was developed and its performance characteristics validated by the Molecular Genetics Laboratory at the Hospital for Sick Children. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. This test is used for clinical purposes.