

Pinnacle's Glutamate Biosensor FAQs

Q: What is the detection limit of your biosensors? What is the smallest addition of glutamate during a calibration that the sensor can register?

A; $\sim 0.1 - 0.4 \mu\text{M}$ in vitro. This will vary between sensors.

Q: Will the response of the biosensor to a lesser amount of glutamate be as rapid or is it dependent on concentration?

A: This will be independent of concentration. The real issue is diffusional characteristics of the tissue and distance from the target.

Q: What's the typical time frame after implantation to reach a stable baseline?

A: 30-45 minutes

Q: Why is the precalibration is done at normal room temperature? Why couldn't it be done like the post-calibration at 37° C?

A: The precalibration is only for warranty purposes and to make sure the sensor is working properly. It can be performed at 37° C. Post-calibration determines the in vivo sensitivity.

Q: Can we have our sensor order shipped on days other than Tuesday or Friday?

A: Yes, orders for 6+ sensors can be shipped any day other than Monday. We do not ship sensors on Mondays because manufacturing requires two consecutive days of production. If you have a small order for sensors that need special handling, contact us and we will try to assist. We try very hard to be customer responsive.

Q: Can the glutamate sensor be used with another company's potentiostat?

Yes, as long as the bias can be set to 0.6V, and it has sufficient capacity to measure the expected current for your research project.

Q: When I calibrate the sensor there is an immediate response to glutamate, but then there appears to be an upward drift. Is this normal?

A: Yes, there will be a slight drift with time. The sensor is not meant to measure the basal level. It measures immediate changes in the concentration of glutamate.

Q: What is the electrolyte composition and what is the life duration of the electrode?

A: At its core, the glutamate biosensor is a Teflon coated platinum-iridium electrode. At the "sensing" end of the electrode, a 1 mm section of platinum is left bare (the sensing cavity). On this section we incorporate various membranes to form a selective barrier to various electroactive compounds such as ascorbic acid. The enzyme glutamate oxidase (converts Glutamate --> H₂O₂) is immobilized on the sensing cavity as well as ascorbate oxidase (converts ascorbate-->water). The enzymatically created H₂O₂ can then be measured by its oxidation at the platinum surface with an applied potential of 0.6 V.

We warranty the sensor for one precalibration for 21 days from the day of manufacture. Once implanted, you may begin experiments with 30-45 minutes. We recommend that you complete the recording within 24 - 72 hours. This is because of the forming of a biological membrane on the sensor that occurs upon implantation. This membrane will cause increased sensitivity loss over time.

Q: Is the sensor sensitive to glutamine?

Because of its close structural similarity to glutamate, glutamine is a possible substrate for glutamate oxidase. The enzyme's preferred substrate is glutamate. However, glutamine will also be converted into hydrogen peroxide by glutamate oxidase. The enzymatically created H₂O₂ will diffuse through the sensor membranes and be oxidized on the platinum sensing surface.

The enzyme becomes insensitive to changes in glutamine levels when the glutamine concentration reaches 10 - 15 uM. The immediate (< 5 s response) to glutamine rapidly decreases as the concentration of glutamine in solution increases. Glutamine levels do not affect the response to glutamate.

Q: When we post-calibrate the sensor we have a large response to ascorbic acid that we did not see in the precalibration.

A: The films on the sensors are delicate and were probably damaged during implantation or explantation. By examining your data, you should be able to make a determination as to data validity and when the sensor was damaged.

Q: Our precalibration indicates that the sensor is not working properly. What can we do?

A: The sensors are delicate and can be damaged during shipping and especially handling. Unfortunately, damaged sensors cannot be reclaimed. The sensors are warranted until first precalibration, or 21 days from the date of manufacture, whichever is first. To file a warranty claim contact Pinnacle. You will need to return the sensor in its original packaging and the data from your precalibration.

Q: How far below the cannula does the sensing cavity extend on Pinnacle's Sensor with Cannula Head?

A: The Sensor with Head is manufactured so that it protrudes approximately 3 mm from the end of the guide cannula. The sensing cavity is approximately 1mm in length. The sensing cavity is the area between the end of the Teflon coating and the epoxy seal at the tip of the sensor (it does NOT include the epoxy seal on the tip). When you implant the electrode, your target area should be between 2 and 3 mm below the end of the guide cannula. All of our electrodes are made by hand, so there will be a slight variation. (see diagrams below)

