# Patient Safety Alert

Veterans Health Administration Warning System
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**Item:** **Glucose Monitoring Test Strips that utilize Glucose Dehydrogenase Pyrroloquinoline Quinone (GDH-PQQ) methodology may give falsely elevated glucose results**

**General Information**: On August 13, 2009, FDA issued a Public Health Notification: Potentially Fatal Errors with GDH-PQQ Glucose Monitoring Technology (Attachment 1).

In certain patients who are receiving therapeutic products containing certain non-glucose sugars such as maltose, xylose and galactose (Table 1), results may be falsely elevated if GDH-PQQ methodology is utilized by the test strips and their associated devices (Attachment 1). These non-glucose sugars may mask significant hypoglycemia or prompt excessive insulin administration, leading to serious patient injury or death.

**Actions:**

1. By Close of Business (COB) October 16, 2009, the Facility Director (or designee) will:
   a. Determine the brand of glucometers used in the VAMC clinics, inpatient and outpatient areas and determine if the identified glucometers are using GDH-PQQ methodology. (List of GDH-PQQ glucometers are found on pages 8 and 9 of this Alert).
   NOTE: Facilities may switch to non GDH-PQQ methodology POC testing devices in their patient care areas.
   b. Assure that if glucometers with GDH-PQQ methodology are used, complete remaining actions on this Alert.
   NOTE: If non GDH-PQQ methodology glucometers are used, no further action is required. Defer to action 3.
   c. Assure that a comprehensive list of Veterans receiving peritoneal dialysis (PD), including those VA patients on contracted services, is developed and a letter is sent to each identified Veteran requesting contact with the medical center to confirm the type of PD solution the Veteran is using (Attachment 2). In lieu of a letter, the medical center may contact the Veterans directly.

d. Assure that all Veterans currently (and future) receiving the peritoneal dialysis solution, Extraneal, are confirmed to have:
    i. Received a Baxter safety kit including a safety alert bracelet and are encouraged to wear it. See Link below.
    http://www.glucosesafety.com/us/index.html
    ii. If an outpatient receiving Extraneal requires a home glucose monitoring device the appropriate blood glucose meter (i.e., using non-GDH-PQQ methodology) has been dispensed.
    http://www.glucosesafety.com/us/pdf/countryspecific_glucose_list.pdf
e. Assure that a comprehensive list of all at-risk outpatients, including those VA patients on contracted services, is compiled (in addition to the PD patients) to include individuals on the other interfering therapies (i.e. Abatacept, Immune Globulin, etc.). The Chief of Pharmacy (or designee) shall ensure identified outpatients and future at-risk patients have blood glucose monitors that do not use the GDH-PQQ methodology.
f. Assure that, for facilities that use POC blood glucose monitors with GDH-PQQ methodology) in their patient care areas:
    i. That a comprehensive list of all at-risk patient care areas is compiled for the facility and CBOCs. Such areas should include, at minimum, dialysis units, rheumatology and infusion clinics but may also include other areas of vulnerability. Additional areas include departments where such interfering agents are administered or where patients are unable to participate in their care due to confusion or unresponsiveness (e.g., ED, ICU, post-operative suites, etc.).
    ii. That all clinical staff, particularly those in at-risk patient care areas, are educated on the risks of falsely elevated glucose readings when using POC blood glucose monitors using GDH-PQQ methodology.
    iii. All at-risk patient care area clinical staff are advised to use the facility's clinical laboratory for glucose testing in lieu of point-of-care (POC) blood glucose testing.

2. By COB October 16, 2009, the Pharmacy ADPAC (or designee) will ensure that:

a. The following medications/solutions are available for selection as non-VA medications in CPRS, to facilitate drug interaction checks when providers select these medications.

- Extraneal (Icodextrin)
- Gammimune (Immune Globulin Intravenous)
- HepaGam B (Hepatitis B Immune Globulin Intravenous)
- Orencia (Abatacept)
- Bexxar (tositumomab and Iodine 131tositumomab)

b. Interfering medications (Table 1) used at the facility shall not be selectable via the in-patient or outpatient alphabetical medication lists in CPRS. These medications shall only be available via consult and/or quick order highlighting the drug-device interaction risks.

3. By COB November 16, 2009, the Patient Safety Manager will document on the VHA Hazard Alerts and Recalls website that facility leadership has reviewed and implemented these actions.

**Sources:** FDA and ISMP.

**Additional Information:** **Sites in need of additional support for IT related processes are advised to log a Remedy ticket or contact the VA Service Desk at 1-888-596-4357 for assistance.**

For other vulnerabilities associated with the use of portable blood glucose monitors, their associated test strips, and accessories. See the link below.
http://www.patientsafety.gov/SafetyTopics/BloodGlucoseMonitors.pdf

**Attachments:**
1. FDA Public Health Notification: Potentially Fatal Errors with GDH-PQQ* Glucose Monitoring Technology
2. Example letter to Veterans receiving peritoneal dialysis (PD)

**Contact:** Mr. Bryanne Patail or Mr. Keith Trettin at the VA National Center for Patient Safety (NCPS) at (734) 930-5890,
or
Mr. Vincent Calabrese at the Pharmacy Benefits Management (PBM) at (708) 786-7862.

**Table 1. Products that may cause a drug-device interaction with certain glucose meters and test strips.** (Courtesy of ISMP, Roche and Abbott).

| Drug | Indication |
|---|---|
| **EXTRANEAL** (icodextran) | Peritoneal dialysis |
| **GAMIMUNE N 5%** and **OCTAGAM** (immune globulin intravenous, human) | Immunodeficiency |
| **ORENCIA (**abatacept) | Rheumatoid arthritis |
| **WINRHO SDF LIQUID** [Rho (D) immune globulin intravenous (human)] | Idiopathic Thrombocytopenia Purpura (ITP) and Rh transfusion reaction |
| **D-XYLOSE** (d-xylose absorption test, blood and urine) | Test for malabsorption |
| **HEPAGAM B** [hepatitis B immune globulin (human)] | Acute exposure to HBsAG or HBV |
| **ADEPT ADHESION REDUCTION SOLUTION** (icodextran) | Reduce post surgical laparoscopic adhesions in gynecologic surgery |
| **BEXXAR** (tositumomab and Iodine 131tositumomab) | non-Hodgkin's lymphoma |
| **Vaccinia Immune Globulin (human)** | Treatment of adverse reactions to smallpox vaccine |

**ATTACHMENT 1**
**FDA Public Health Notification: Potentially Fatal Errors with GDH-PQQ* Glucose Monitoring Technology**

** glucose dehydrogenase pyrroloquinoline quinone*

**Date: August 13, 2009**

Dear Healthcare Practitioner:

This is to alert you to the possibility of falsely elevated blood glucose results when using GDH-PQQ glucose test strips on patients who are receiving therapeutic products containing certain non-glucose sugars. These sugars can falsely elevate glucose results, which may mask significant hypoglycemia or prompt excessive insulin administration, leading to serious injury or death. The following provides background information on this problem, a summary of fatality reports FDA has received, and recommendations to reduce the risk. This problem can occur wherever these products are used including in-patient and out-patient healthcare facilities, and at home.

**Nature of the problem**

GDH-PQQ glucose monitoring measures a patient's blood glucose value using methodology that cannot distinguish between glucose and other sugars. Certain non-glucose sugars, including maltose, xylose, and galactose, are found in certain drug and biologic formulations, or can result from the metabolism of a drug or therapeutic product.

When these non-glucose sugars are present in the patient's blood, using a GDH-PQQ glucose test strip will produce an elevated glucose result which may suggest the need for clinical action. This can lead to inappropriate dosing and administration of insulin, potentially resulting in hypoglycemia, coma, or death.

In addition, cases of actual hypoglycemia may go unrecognized if the patient and healthcare practitioner rely solely on the test result obtained with the GDH-PQQ glucose test strips.

**Other glucose test strip methodologies are not affected by the presence of non-glucose sugars**. The unaffected methods are glucose oxidase, glucose dehydrogenase nicotine adenine dinucleotide (GDH-NAD), or glucose dehydrogenase flavin adenine dinucleotide (GDH-FAD).

Laboratory-based blood glucose assays do not use GDH-PQQ methodology and are not subject to falsely elevated results from non-glucose sugars.

**Recommendations**

- Avoid using GDH-PQQ glucose test strips in healthcare facilities.
  List of GDH-PQQ Glucose Test Strips
- If your facility currently uses GDH-PQQ glucose test strips, NEVER use them on patients:
  - who are receiving interfering products**, or

**ATTACHMENT 1 (continued)**

- from whom or about whom you cannot obtain information regarding concomitant medication use, e.g., patients who are unresponsive or cannot adequately communicate.

  **Interfering products containing non-glucose sugars include:

  - Extraneal (icodextrin) peritoneal dialysis solution
  - Some Immunoglobulins: Octagam 5%, Gamimune N 5%***, WinRho SDF Liquid, Vaccinia Immune Globulin Intravenous(Human), and HepaGamB
  - Orencia (abatacept)
  - Adept adhesion reduction solution (4% icodextrin)
  - BEXXAR radioimmunotherapy agent
  - Any product containing, or metabolized into maltose, galactose or xylose.

  Use ONLY laboratory-based glucose assays on these patients.

- Determine whether patients are receiving interfering products on admission and periodically during their stay at your facility.
- Educate staff and patients about the potential for falsely elevated glucose results in the presence of certain non-glucose sugars when using GDH-PQQ glucose test strips.
- Consider using drug interaction alerts in computer order entry systems, patient profiles and charts to alert staff to the potential for falsely elevated glucose results.
- Periodically verify glucose meter results with laboratory-based glucose assays if you are using GDH-PQQ test strips in patients who are not receiving interfering products.

*** *Within the U.S., Gamimune N 5% has not been manufactured since December 2005, and no lots are in distribution in the U.S.*

In addition, an Advice for Patients can be found on the FDA Consumer website.

**Reports received by FDA**

From 1997-2009, FDA received 13 reports of death associated with GDH-PQQ glucose test strips in which there was documented interference from maltose or other non-glucose sugars. Six of the 13 deaths have occurred since 2008 despite FDA's efforts to communicate the risk. The deaths occurred in healthcare facilities. Ten of the 13 patients were receiving Extraneal (icodextrin) peritoneal dialysis solution for renal failure. Three of the 13 patients were receiving maltose-containing substances; one was receiving Potacor R, one was receiving Octagam (IVIG), and another was receiving an infusion that contained maltose. Patients were treated with insulin doses or insulin drips that were guided by falsely elevated results.

Eight reports specified that test result values generated on GDH-PQQ test strips were 3 to 15 times higher than corresponding laboratory results. For example, in one patient the GDH-PQQ system generated a result of 200 mg/dL while the laboratory result was 19 mg/dL. In another case, a patient undergoing peritoneal dialysis with Extraneal was tested with a GDH-PQQ test

**ATTACHMENT 1 (continued)**

strip which gave a result of 193 mg/dL, while the result obtained using a laboratory instrument was 8 mg/dL.

Some reports indicated that serious patient injury, such as hypoglycemia, confusion, neurologic deterioration, severe hypoxia, brain damage, and coma occurred prior to death.

FDA is working with manufacturers to address patient safety problems with GDH-PQQ glucose test strips and will continue to monitor adverse events associated with these products.

**Reporting adverse events**

FDA requires hospitals and other user facilities to report deaths and serious injuries associated with the use of medical devices. If you suspect a reportable adverse event associated with a glucose meter or glucose test strip, you should follow the reporting procedure established by your facility. Prompt reporting of adverse events can improve FDA's understanding of and ability to communicate the risks associated with devices and assist in the identification of potential future problems associated with medical devices. If you suspect a falsely elevated blood glucose value associated with a non-glucose sugar interference, include information about the associated drug or biologic product in your adverse event report.

We also encourage you to report any medical device adverse events related to glucose meters or glucose test strips that do not meet the requirements for mandatory reporting. You can report these directly to the device manufacturer or to MedWatch, the FDA's voluntary reporting program. This can be done online at https://www.accessdata.fda.gov /scripts/medwatch /medwatch-online.htm, by phone at 1-800-FDA-1088, by FAX at 1-800-FDA-0178; or by mailing FDA form 3500 (download from http://www.fda.gov/ Safety/MedWatch/ HowToReport/DownloadForms) to MedWatch, 5600 Fishers Lane, Rockville, MD 20857-9787.

**Getting more information**

If you have questions about this Notification, please contact FDA's Office of Surveillance and Biometrics by e-mail at phann@fda.hhs.gov or by phone at 301-796-6640.

FDA Medical Device Public Health Notifications are available on the Internet at http://www.fda.gov/ MedicalDevices/Safety/ AlertsandNotices/ PublicHealthNotifications. You can also be notified through email each time a new Public Health Notification is added to our web page. To subscribe, visit: http://service.govdelivery.com/ service/subscribe.html?code=USFDA_39.

Sincerely yours,

Daniel G. Schultz, MD
Director
Center for Devices and Radiological Health
Food and Drug Administration

**ATTACHMENT 1 (continued)**

**Related Links**

- FDA Patient Safety News October 2008. Potentially Fatal Glucose Monitoring Errors with Icodextrin
- FDA Drug Safety Newsletter Summer 2008. Volume1, Number 4. Icodextrin (marketed as EXTRANEAL) and Point-of-Care Glucose Monitoring.
- Institute for Safe Medication Practices (ISMP) Medication Safety Alert! June 19, 2008. FDA Advise-ERR: Prevent dangerous drug-device interaction causing falsely elevated glucose levels.
- FDA Center for Biologics Evaluation and Research April 17, 2008. Fatal Iatrogenic Hypoglycemia: Falsely Elevated Blood Glucose Readings with a Point-of-Care Meter Due to a Maltose-Containing Intravenous Immune Globulin Product.
- FDA Patient Safety News February 2006 and September 2006. Avoiding Glucose Monitoring Errors in Patients Receiving Other Sugars.
- FDA MedWatch Safety Alert 2005. Parenteral Maltose/Parenteral Galactose/Oral Xylose-Containing Products.

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**List of GDH-PQQ Glucose Test Strips**

The following test strips (with associated meters) use GDH-PQQ methodology as of August 2009:

**Roche Diagnostics:**

1. ACCU-CHEK Comfort Curve test strips, for use with:
    - ACCU-CHEK Inform meters [model 2001201]
    - ACCU-CHEK Complete meters [models 200 and 250]
    - ACCU-CHEK Advantage meters [models 888, 831, 850, and 768]
    - ACCU-CHEK Voicemate meters [model 0009221]
2. ACCU-CHEK Aviva test strips, for use with:
    - ACCU-CHEK Aviva meters [models 525, 535, and 555]
3. ACCU-CHEK Compact test strips, for use with:
    - ACCU-CHEK Compact meters [model GF]
    - ACCU-CHEK Compact Plus meters [models GP and GT]
4. ACCU-CHEK Go test strips
    - ACCU-CHEK Go meters [model GJ]
5. ACCU-CHEK Active test strips
    - ACCU-CHEK Active meters [models GG and GN]

**ATTACHMENT 1 (continued)**

**Abbott Diabetes Care:**

1. Freestyle test strips, for use with:
    - FreeStyle meters
    - FreeStyle Flash meters
    - FreeStyle Freedom meters
2. Freestyle Lite test strips, for use with:
    - FreeStyle Lite meters
    - FreeStyle Freedom Lite meters

**Home Diagnostics:**

1. TRUEtest test strips
    - TRUEresult meters
    - TRUE2go meters

**Smiths Medical:**

1. Abbott Diabetes Care Freestyle test strips, for use with:
    - CoZmonitor blood glucose module (for use with the Deltec Cozmo Insulin Pump)

**Insulet:**

1. Abbott Diabetes Care Freestyle test strips, for use with:
    - OmniPod Insulin Management System

*Note: Test strips currently on the market may be distributed under multiple trade names. In addition, manufacturers of GDH-PQQ test strips currently on the market may subsequently change to non-GDH-PQQ methodology. Therefore, healthcare providers (and patients) should refer to device labeling or consult with test strip manufacturers to confirm the type of methodology used.*

**ATTACHMENT 2**
**Example letter to Veterans receiving peritoneal dialysis (PD)**

**Department of Veterans Affairs**

**Veterans Health Administration**

**<INSERT DATE HERE>**

Dear Veteran,

You have been identified as an individual receiving Peritoneal Dialysis. Since some of our dialysis patients may receive treatment or management by a non-VA nephrologist, we would like to take the opportunity to speak with you via phone to confirm that our records are complete and up-to-date with the current type of peritoneal dialysis solution you are using. Please take the opportunity to contact us via our 800 number <INSERT YOUR SPECIFIC NUMBER> to speak with a member of our nursing/pharmacy staff by October 15th 2009. This call should take only 5 minutes of your time.

Thank you for the opportunity to continue to serve you and your health care needs. Your participation will help ensure the accuracy of your medical record.

Sincerely,