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David Gregg and Pascal J. Goldschmidt-Clermont

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Platelets and Cardiovascular Disease

David Gregg, MD; Pascal J. Goldschmidt-Clermont, MD



Platelets are specialized disk-shaped cells in the blood stream that are involved in the formation of blood clots that play an important role in heart attacks, strokes, and peripheral vascular disease. In most people, the more than 200 million platelets in a milliliter of blood act as tiny building blocks to form the basis of a clot to stop bleeding from cuts or injuries. Platelets can detect a disruption in the lining of a blood vessel and react to build a wall to stop bleeding (Figure 1).

In cardiovascular disease, abnormal clotting occurs that can result in heart attacks or stroke. Blood vessels injured by smoking, cholesterol, or high blood pressure develop cholesterol-rich build-ups (plaques) that line the blood vessel; these plaques can rupture and cause the platelets to form a clot. Even though no bleeding is occurring, platelets sense the plaque rupture and are confused, thinking that an injury has taken place that will cause bleeding. Instead of sealing the vessel to prevent bleeding as would occur with a cut, a clot forms in an intact blood vessel, causing a blockage of blood flow (Figure 2). Without blood, a portion of the heart muscle can die, leading to a heart attack.

Platelet Disorders

Platelets may be abnormal either quantitatively (too many or too few) or qualitatively (the right number but

they do not work correctly). The number of platelets is routinely tested as part of the complete blood count (CBC). Normal counts range from 150 000 to 450 000. A decrease in the number of platelets indicates a condition known as thrombocytopenia and may result in increased bleeding, the first signs of which may include gum bleeding, nose bleeds, and increased bruising. In cardiology, the most frequent cause of a low platelet count is an abnormal immune response caused by drug therapy, particularly with the intravenous blood thinner heparin (heparin-induced thrombocytopenia), and rarely with other drugs to control high blood pressure or symptoms of congestive heart failure (diuretics), to control diabetes (antidiabetic medications), or to regulate your blood clotting (antiplatelet drugs). Elevated

platelet counts can also occur, usually in association with diseases in the elderly, and can result in either excess clotting or even abnormal bleeding.

Platelet Dysfunction

Because platelets are so important in stopping bleeding from everyday injuries such as cuts or bruises, severe inherited disorders of platelets are quite rare. Researchers, however, have discovered more subtle genetic variations in platelets called polymorphisms that may alter platelets in subtle ways to raise the risk of cardiovascular disease when combined with other risk factors, but which on their own do not result in overt disease. These polymorphisms may also be important in understanding who may gain the greatest benefit from drugs such as aspirin that alter platelet function. Because abnormal clots cause heart at-

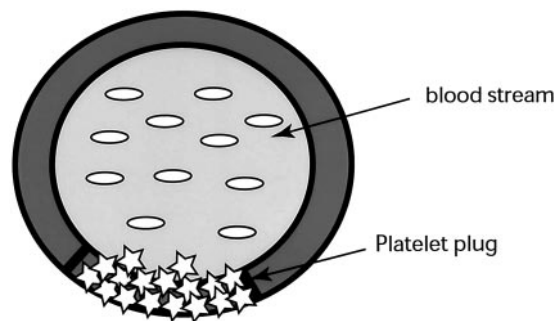


Figure 1. Platelets form a platelet plug to stop bleeding from an injured blood vessel.

From the Department of Medicine, Division of Cardiology, Duke University Medical Center, Durham, NC.
 Correspondence to Pascal J. Goldschmidt-Clermont, MD, Division of Cardiology, Duke University Medical Center, Durham, NC 27710. E-mail golds017@mc.duke.edu
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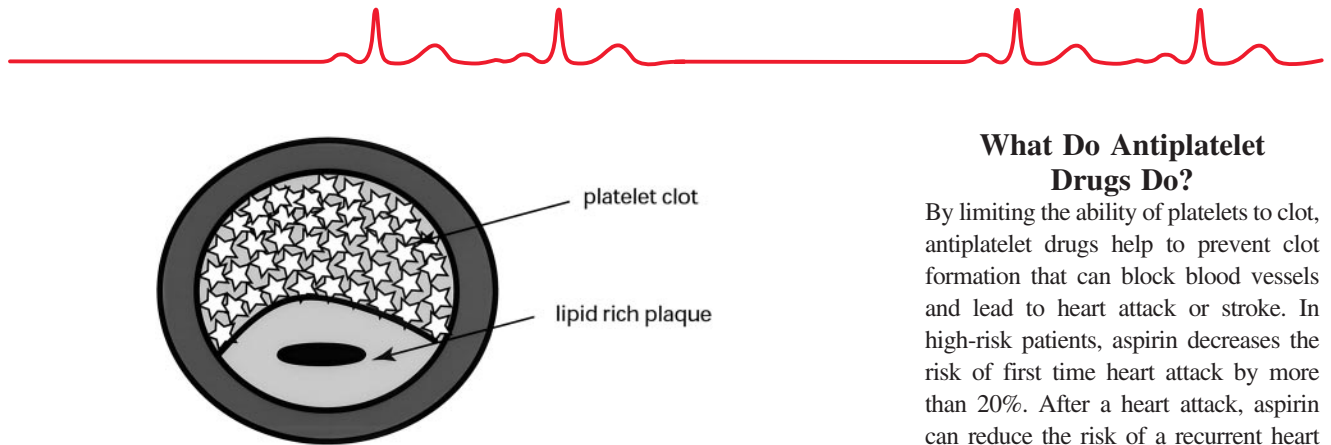


Figure 2. Plaque rupture results in clot formation to block blood flow, which may result in a heart attack or stroke.

tack, your doctor can prescribe drugs (antiplatelet agents) to inhibit clot formation and reduce the risk of cardiovascular disease.

are taking an anticoagulant, you should discuss with your doctor whether it is proper for you to take an antiplatelet drug such as aspirin.

Antiplatelet Agents

The most commonly used antiplatelet agent is aspirin, although you may also be prescribed other oral agents, such as ticlopidine, clopidogrel, or dipyridamole, or intravenous antiplatelet drugs such as abciximab or eptifibatide while you are in the hospital or undergoing angioplasty procedures. Each agent affects platelets in slightly different ways and may have unique side effects, but all either cause the platelets to stick together or induce them to clot less well. Your doctor will choose the drug that best suits your situation. Table 1 shows some of the unique features of commonly used oral antiplatelet drugs.

Antiplatelet drugs are different than blood thinners or anticoagulants such as warfarin (Coumadin, Bristol-Myers Squibb) or heparin. Anticoagulants block a second step in clotting known as coagulation but do not directly affect the platelets. If you

TABLE 2. Uses for Antiplatelet Agents

Prevention of heart disease
During heart attack
Progressive chest pain (unstable angina)
After a heart attack
During or after angioplasty and stenting
Prevention of stroke or TIA
Atrial fibrillation (low risk patients)
Peripheral vascular disease

When Are Antiplatelet Agents Used?

Antiplatelet agents are used to treat many common cardiovascular problems. Your doctor may recommend aspirin to prevent a heart attack if you have risk factors for heart disease. Both aspirin and more powerful intravenous antiplatelet agents may be used if you are having uncontrolled chest pain or a heart attack. Other common uses are listed in Table 2.

What Do Antiplatelet Drugs Do?

By limiting the ability of platelets to clot, antiplatelet drugs help to prevent clot formation that can block blood vessels and lead to heart attack or stroke. In high-risk patients, aspirin decreases the risk of first time heart attack by more than 20%. After a heart attack, aspirin can reduce the risk of a recurrent heart attack by about 30%. Similarly, an antiplatelet agent can reduce the risk of recurrent stroke or transient ischemic attack and help to prevent the blockage (occlusion) of vessels that have previously been opened (patency) with a stent.

How Are Antiplatelet Drugs Monitored?

Unlike anticoagulants such as warfarin or heparin, antiplatelet therapy generally does not require blood test monitoring. Researchers are working to develop tests that may more easily test platelet function and an individual's response to antiplatelet agents to better predict what drug works best with the fewest side effects for a unique patient. These tests, however, are not yet widely available.

Additional Resources

American Heart Association. Heart and stroke facts. Available at: <http://www.americanheart.org/downloadable/heart/10148338654401013191236985HSfacts02.pdf>. Accessed August 27, 2003.
 Medem, Inc. Medical library: heart disease/stroke/coronary artery disease and heart attack. Available at: http://www.medem.com/MedLB/articleslb.cfm?sub_cat=272. Accessed August 27, 2003.

TABLE 1. Commonly Used Oral Antiplatelet Drugs: Uses and Side Effects

	Aspirin	Clopidogrel	Ticlopidine	Dipyridamole + Aspirin
Uses	Heart disease and stroke; inexpensive	Heart disease and stroke, particularly after stenting	Mostly in stroke; requires blood count monitoring	Stroke; may not be suitable for patients with heart disease
Side effects	Gastrointestinal (GI) intolerance; GI bleeding	Diarrhea (much less common than with ticlopidine); rash and itching	Diarrhea and GI upset (usually resolves in 2 weeks); may decrease blood counts, particularly white blood cells	Headache; GI bleeding; GI intolerance



Summary: What to Watch for

- The most significant side-effect of antiplatelet therapy is that it may increase bleeding
- Signs of abnormal platelet function may include
 - Black or bloody stools
 - Pink or bloody urine
 - Increased menstrual bleeding
 - Bleeding gums
 - Nose Bleeds
- Do not take aspirin with anticoagulants unless instructed by your doctor
- Avoid over the counter pain medicines (NSAIDS) except Tylenol. Use of these pain medicines can increase your risk of stomach bleeding and may, particularly with ibuprofen (Advil), limit the benefit of aspirin in cardiovascular prevention.
- Be aware that cold medicines, back ache remedies, and other medicines may contain aspirin or ibuprofen.
- Tell your doctor or dentist before surgical or dental procedures that you are taking an antiplatelet drug.