

milk thistle

Milk Thistle Supplements -
What It IS
What It Does
Quality Concerns and What CL Tested For
What CL Found
Test Results by Product
What to Consider When Buying
What to Consider When Using
Concerns and Cautions
Full List of Ingredients by Product
How Products were Evaluated
What It IS:
The ripe seeds of the milk thistle plant (*Silybum marianum*) are used medicinally. One of the most important constituents of milk thistle is silymarin, which itself consists of several constituents, the most prominent of which is silybinin (silybin).

What It Does:

Diabetes:

The silymarin component of milk thistle may decrease blood sugar, hemoglobin A1c, and LDL cholesterol levels when used with conventional therapy in people with type 2 diabetes. It has also been shown to reduce insulin resistance in people with coexisting diabetes and alcoholic cirrhosis.

Diseases of the Liver:

Silymarin is thought to act as a liver-protectant. However, evidence of benefit in liver disease has been mixed.

One preliminary study of a specific silybinin preparation improved liver function in people with chronic active hepatitis. However, most studies in patients with hepatitis B or C have generally not shown an improvement in mortality or liver function using milk thistle or preparations of milk thistle. Similarly, in alcoholic liver disease, some preliminary clinical studies suggested that milk thistle might improve liver function and mortality. However, an analysis of several studies did not show a significant effect.

Preliminary evidence suggests that milk thistle extract standardized to 70% - 80% silymarin may protect the liver against damage from certain toxins, including drugs such as acetaminophen and phenytoin (Dilantin).

Administered intravenously (IV), silybinin may lessen liver damage due to poisoning by Amanita phalloides mushroom (death cap) - although this IV preparation is not readily available in the U.S.

Other:

Silybinin is under investigation for use in preventing or treating various forms of cancer, especially prostate cancer.

For information about dosage, see What to Consider When Using section.

Quality Concerns and What CL Tested For:

Most clinical studies of milk thistle's effectiveness have used specific dry extracts standardized to approximately 70 - 80% silymarin on a weight basis. Consumerlab.com purchased and tested milk thistle products to determine which extracts on the market contained this level of silymarin. Milk thistle is also available in non-concentrated, seed powder form containing at least 1.5% silymarin and such products were also purchased and tested.

All products were also tested for lead contamination, as this can occur in herbal supplements. Tablet and caplet products were additionally tested for their ability to properly break apart for absorption. Liquid products and standard capsules do not

undergo this testing, as they will quickly release their contents.

What CL Found: milk thistle
Among nine milk thistle supplements selected for testing, only two contained the expected amounts of silymarin compounds. The following products failed to provide the expected amounts of silymarin:
Enzymatic Therapy™ Milk Thistle X – only 59.2% of its claimed silymarin
Nature's Apothecary® Milk Thistle – only 19.5% of the expected silymarin
Planetary Herbals™ Full Spectrum™ Silymarin 80 – only 64% of its expected silymarin
Rainbow Light® Milk Thistle Plus – 83.8% of its claimed silymarin. It also contained 1.1 mcg of lead per daily serving, exceeding the State of California limit
Rite Aid Milk Thistle 200 mg contained only 65.8% of its claimed silymarin
Whole Foods™ Standardized Milk Thistle 100 mg contained only 64% of its claimed silymarin
Silymarin
Designs for health® Milk Thistle did not identify the part of milk thistle utilized (normally, the seed), thus violating FDA labeling requirements and disqualifying it from further review.

One product was sold in tablet form and, therefore, underwent disintegration testing: It passed this analysis, showing that it broke apart properly to release its contents.

The suggested daily doses of products varied widely. Among products that passed testing (including two others that passed the same evaluation through Consumerlab.com's Voluntary Certification Program) daily amounts ranged from 15 mg to 1,200 mg of silymarin. With such a wide range, it is important to choose a product with the amount appropriate to your needs. These levels are often a function of whether the milk thistle used was a concentrated extract or non-concentrated seed powder/meal. For more information about this see the ConsumerTips™ section.

Test Results by Product:
Listed alphabetically below are the test results for eleven milk thistle products. Nine were selected by Consumerlab.com and two others (each indicated with an asterisk) are included for having passed the same evaluation through Consumerlab.com's Voluntary Certification Program). Also listed is one product similar to one that passed but sold under a different brand name.

The full list of ingredients is available for each product by clicking on the word "Ingredients" in the first column. Products listed as "Approved" met their label claim and Consumerlab.com's standards for milk thistle products (See Passing Score).

RESULTS OF CONSUMERLAB.COM TESTING OF MILK THISTLE SUPPLEMENTS
Click on beneath a product name to find a vendor that sells it.
To find retailers that sell some of the listed products click here.
Product Name, Claimed Amount and Type of Milk Thistle per Unit, Standardized Level of Silymarin, and Suggested Dose on Label

Click on "Ingredients" for Full Listing
Company
(Dist. =
Dist-
ributor
Mfd. =
Manu-
facturer)
Claimed (C) or Minimum Expected (E) Amount of Silymarin Per Daily Serving
Suggested on Label (mg) OVERALL RESULTS:
(Passed)
or
NOT
APPROVED

(Failed)

milk thistle

(See How Products were Evaluated) Contained Claimed or Minimum Expected Amount of Silymarin Purity (Lack of Lead Contamination) Disintegrated Properly (NA = Not Applicable. only applies to tablets and caplets)

General designs for health® Milk Thistle (140 mg per capsule [80% silymarin], 1 per day) Ingredients Dist. by Designs for Health, Inc 112 mg (C)
NOT APPROVED
Did not list plant part ** NA
NA
NA

Enzymatic Therapy™ Milk Thistle X™ (150 mg standardized extract [80% silymarin] per ultracap, 6 per day)
Ingredients
Mfd. by Enzymatic Therapy, Inc. 720 mg (C)
NOT APPROVED Found only 59.2% of claimed silymarin

NA

Gaia Herbs Liquid Phyto-Caps Milk Thistle Seed (150 mg extract [80% silymarin] per capsule, 3 per day)
Ingredients Dist. by Gaia Herbs 360 mg (C)
APPROVED

NA

Nature's Apothecary® Milk Thistle (equivalent to 500 mg seed per ml of liquid, 1-3 ml per day)
Ingredients
Mfd. by Nature's Apothecary 7.5 mg - 22.5 mg (E)1
NOT APPROVED Found only 19.5% of expected silymarin

NA

Nature's Way® Thisilyn® Standardized Milk Thistle Extract Maximum Absorption Formula 2X (175 mg extract [80% silymarin] per capsule, 3 per day)*
Ingredients

Dist. by Nature's Way 420 mg (C)
APPROVED

NA

Planetary Herbals™ Full Spectrum™ Silymarin 80™ 260 mg (210 mg extract [80% silymarin] and 50 mg organic seed per tablet, 1-2 per day)
Ingredients Dist. by Planetary Formulas 168.7 mg - 337.5 mg (E)2
NOT APPROVED Found only 64% of expected silymarin

NA

Rainbow Light® Milk Thistle Plus™, (500 mg of 4:1 extract [providing 50 mg silymarin] per tablet, 3 per day)
Ingredients Dist. by Rainbow Light Nutritional Systems 150 mg (C)
NOT APPROVED Found only 83.8% of claimed silymarin
Found 1.1 mcg lead per daily serving

Rite Aid Milk Thistle 200 mg (200 mg extract [80% silymarin] per capsule, 1-3 per day)
milk thistle
Ingredients Dist. by Rite Aid Corporation 160 mg - 480 mg (C)
NOT APPROVED Found only 65.8% of claimed silymarin

NA

Trader Darwin's™ Milk thistle 250 (250 mg extract 30:1 [80% silymarin] per capsule, 1-6 per day)
Ingredients Dist. by Trader Joe's 200 mg - 1200 mg (C)
APPROVED

NA

Vitamin World® Silymarin Milk Thistle 1000 mg (250 mg of a 4:1 extract equivalent to 1,000 mg seed per softgel, 1-2 per day)*
Ingredients Dist. by Vitamin World, Inc 15 mg - 30 mg (E)1
APPROVED

NA

Whole Foods™ Standardized Milk Thistle 100 mg (100 mg extract [80% silymarin] per capsule, 4-6 per day)
Ingredients
Dist. by Whole Foods 320 - 480 mg (C)
NOT APPROVED Found only 64% of claimed silymarin

NA

Similar to Approved Products***
Puritan's Pride® Silymarin Milk Thistle 1000 mg (250 mg of a 4:1 extract equivalent to 1,000 mg seed per softgel, 1-2 per day)
Ingredients
Mfd. by Puritan's Pride 15 mg - 30 mg (E) 1

*Tested through CL's Voluntary Certification Program prior to, at time of, or after initial posting of this Product Review.

** Does not meet FDA label requirements. Disqualified from further testing.

*** Product identical in formulation and manufacture to a product that has passed testing but sold under a different brand. For more information see CL's Multi-Label Testing Program.

1 Expected minimum silymarin in seed powder is 1.5% but may contain up to twice that amount.

2 Includes expected minimum silymarin from seed plus claimed 168 mg silymarin from extract per tablet

Unless otherwise noted, information about the products listed above is based on the samples purchased by Consumerlab.com (CL) for this Product Review. Manufacturers may change ingredients and label information at any time. So be sure to check labels carefully when evaluating the products you use or buy. If a product's ingredients differ from what is listed above, it may not necessarily be the same as what was tested.

The information contained in this report is based on the compilation and review of information from product labeling and analytic testing. CL applies what it believes to be the most appropriate testing methods and standards. The information in this report does not reflect the opinion or recommendation of CL, its officers or employees. CL cannot assure the accuracy of information provided to it by third parties. Liability to any person for any loss or damage caused by errors, omissions, or inaccuracies in this report is hereby disclaimed.

milk thistle

Copyright ConsumerLab.com, LLC, 2007. All rights reserved. Not to be reproduced, excerpted, or cited in any fashion without the express written permission of ConsumerLab.com LLC.

ConsumerTips™:

What to Consider When Buying:

Extracts vs. Seed Powder:

Dry milk thistle seed powder contains only 1.5% to about 3.0% silymarin, while dry "extracts" are much more concentrated – with silymarin accounting for approximately 70% to 80% of their weight. Consequently, pills made from seed powder contain about 9 to 15 mg of silymarin, while pills made from dry extracts contain approximately 112 mg to 240 mg of silymarin, depending on the size of the pill. Be aware, however, that "liquid extracts" are not necessarily concentrated extracts. One liquid extract product tested in this review indicated that it was made from milk thistle "seed" as opposed to a "seed extract." Products like this are not concentrated – this particular product was expected to contain only 7.5 mg of silymarin per mL (although testing showed it to actually provide less than 2 mg). People who prefer to use whole herb products as opposed to concentrated extracts should be aware that much larger doses of milk thistle will be necessary to get the same amount silymarin.

What to Consider When Using:

The common dosage of milk thistle is 200 mg 2 to 3 times a day of an extract standardized to 70 to 80% silymarin. For diabetes, the 200 mg is taken 3 times a day along with conventional treatment. For cirrhosis of the liver, a daily dose of 420 mg has been used (expected to contain about 300 to 330 mg of silymarin). For chronic active hepatitis, 240 mg of silybinin (the major constituent of silymarin) taken twice daily has been used. (Among the products tested in this review, silybinin was generally found to account for 50% to 75% of the total silymarin.) There is some evidence that preparations containing phosphatidylcholine may increase absorption of active ingredients of milk thistle.

For treatment of mushroom poisoning with Amanita phalloides, 20 mg to 50 mg/kg of silybinin has been administered intravenously over 24 hours, divided into four infusions, each administered over a two hour period. Intravenous silybinin, however, is not available in the U.S.

Additional information about clinical studies with milk thistle is found in the Natural Products Encyclopedia on this website.

Cautions and Concerns:

Milk thistle and its extracts are generally well-tolerated but, infrequently, can have a laxative effect and cause other gastrointestinal side-effects.

Some patients may have allergic reactions to milk thistle including itching, rash, hives, eczema, and anaphylaxis. Allergic reactions may be more likely to occur in patients sensitive to plants such as ragweed, chrysanthemums, marigolds, and daisies.

Although drug interactions have not been reported, milk thistle might reduce the effectiveness of oral contraceptives and it might inhibit cytochrome P450 2C9, increasing the levels of certain drugs metabolized by it such as amitriptyline, diazepam, verapamil, and warfarin.

To further assist consumers, ConsumerLab.com licenses its Flask-shaped CL Seal of Approved Quality (see The CL Seal) to manufacturers for use on labels of products that have passed its testing. ConsumerLab.com will periodically re-evaluate these products to ensure their compliance with ConsumerLab.com's standards.

Information on this site is provided for informational purposes only. It is not an endorsement of any product nor is it meant to substitute for the advice provided

milk thistle

Sections: Jump to a section by clicking on its name.

What It IS

What It Does

Quality Concerns and What CL Tested For

What CL Found

Test Results by Product

What to Consider When Buying

What to Consider When Using

Concerns and Cautions

Full List of Ingredients by Product

How Products were Evaluated

What It IS:

The ripe seeds of the milk thistle plant (*Silybum marianum*) are used medicinally. One of the most important constituents of milk thistle is silymarin, which itself consists of several constituents, the most prominent of which is silybinin (silybin).

What It Does:

Diabetes:

The silymarin component of milk thistle may decrease blood sugar, hemoglobin A1c, and LDL cholesterol levels when used with conventional therapy in people with type 2 diabetes. It has also been shown to reduce insulin resistance in people with coexisting diabetes and alcoholic cirrhosis.

Diseases of the Liver:

Silymarin is thought to act as a liver-protectant. However, evidence of benefit in liver disease has been mixed.

One preliminary study of a specific silybinin preparation improved liver function in people with chronic active hepatitis. However, most studies in patients with hepatitis B or C have generally not shown an improvement in mortality or liver function using milk thistle or preparations of milk thistle. Similarly, in alcoholic liver disease, some preliminary clinical studies suggested that milk thistle might improve liver function and mortality. However, an analysis of several studies did not show a significant effect.

Preliminary evidence suggests that milk thistle extract standardized to 70% - 80% silymarin may protect the liver against damage from certain toxins, including drugs such as acetaminophen and phenytoin (Dilantin).

Administered intravenously (IV), silybinin may lessen liver damage due to poisoning by Amanita phalloides mushroom (death cap) - although this IV preparation is not readily available in the U.S.

Other:

Silybinin is under investigation for use in preventing or treating various forms of cancer, especially prostate cancer.

For information about dosage, see what to consider when using section.

Quality Concerns and What CL Tested for:

Most clinical studies of milk thistle's effectiveness have used specific dry extracts standardized to approximately 70 - 80% silymarin on a weight basis. Consumerlab.com purchased and tested milk thistle products to determine which extracts on the market contained this level of silymarin. Milk thistle is also available in non-concentrated, seed powder form containing at least 1.5% silymarin and such products were also purchased and tested.

All products were also tested for lead contamination, as this can occur in herbal supplements. Tablet and capsule products were additionally tested for their ability to properly break apart for absorption. Liquid products and standard capsules do not

undergo this testing, as they will quickly release their contents. milk thistle

What CL Found:
Among nine milk thistle supplements selected for testing, only two contained the expected amounts of silymarin compounds. The following products failed to provide the expected amounts of silymarin:
Enzymatic Therapy™ Milk Thistle X – only 59.2% of its claimed silymarin
Nature's Apothecary® Milk Thistle – only 19.5% of the expected silymarin
Planetary Herbals™ Full Spectrum™ Silymarin 80 – only 64% of its expected silymarin
Rainbow Light® Milk Thistle Plus – 83.8% of its claimed silymarin. It also contained 1.1 mcg of lead per daily serving, exceeding the state of California limit
Rite Aid Milk Thistle 200 mg contained only 65.8% of its claimed silymarin
Whole Foods™ standardized Milk Thistle 100 mg contained only 64% of its claimed silymarin
Designs for health® Milk Thistle did not identify the part of milk thistle utilized (normally, the seed), thus violating FDA labeling requirements and disqualifying it from further review.

One product was sold in tablet form and, therefore, underwent disintegration testing: It passed this analysis, showing that it broke apart properly to release its contents.

The suggested daily doses of products varied widely. Among products that passed testing (including two others that passed the same evaluation through Consumerlab.com's Voluntary Certification Program), daily amounts ranged from 15 mg to 1,200 mg of silymarin. With such a wide range, it is important to choose a product with the amount appropriate to your needs. These levels are often a function of whether the milk thistle used was a concentrated extract or non-concentrated seed powder/meal. For more information about this see the ConsumerTips™ section.

Test Results by Product:
Listed alphabetically below are the test results for eleven milk thistle products. Nine were selected by Consumerlab.com and two others (each indicated with an asterisk) are included for having passed the same evaluation through Consumerlab.com's Voluntary Certification Program). Also listed is one product similar to one that passed but sold under a different brand name.

The full list of ingredients is available for each product by clicking on the word "Ingredients" in the first column. Products listed as "Approved" met their label claim and Consumerlab.com's standards for milk thistle products (See Passing Score).

RESULTS OF CONSUMERLAB.COM TESTING OF MILK THISTLE SUPPLEMENTS

Click on beneath a product name to find a vendor that sells it.
To find retailers that sell some of the listed products click here.
Product Name, Claimed Amount and Type of Milk Thistle per Unit, Standardized Level of Silymarin, and Suggested Dose on Label

Click on "Ingredients" for Full Listing
Company
(Dist. =
Dist-
ributor
Mfd. =
Manu-
facturer)
Claimed (C) or Minimum Expected (E)1 Amount of Silymarin Per Daily Serving
Suggested on Label (mg) OVERALL RESULTS:
APPROVED
(Passed)
or
NOT
APPROVED

milk thistle

(Failed)

(See How Products were Evaluated) Contained Claimed or Minimum Expected Amount of Silymarin Purity (Lack of Lead Contamination) Disintegrated Properly (NA = Not Applicable. Only applies to tablets and caplets)

General designs for health® Milk Thistle (140 mg per capsule [80% silymarin], 1 per day) Ingredients Dist. by Designs for Health, Inc 112 mg (C)

NOT APPROVED

Did not list plant part ** NA

NA
NA

Enzymatic Therapy™ Milk Thistle X™ (150 mg standardized extract [80% silymarin] per ultracap, 6 per day)

Ingredients

Mfd. by Enzymatic Therapy, Inc. 720 mg (C)

NOT APPROVED Found only 59.2% of claimed silymarin

NA

Gaia Herbs Liquid Phyto-Caps Milk Thistle Seed (150 mg extract [80% silymarin] per capsule, 3 per day) Ingredients Dist. by Gaia Herbs 360 mg (C) APPROVED

NA

Nature's Apothecary® Milk Thistle (equivalent to 500 mg seed per ml of liquid, 1-3 ml per day)

Ingredients

Mfd. by Nature's Apothecary 7.5 mg - 22.5 mg (E)1

NOT APPROVED Found only 19.5% of expected silymarin

NA

Nature's Way® Thisilyn® Standardized Milk Thistle Extract Maximum Absorption Formula 2X (175 mg extract [80% silymarin] per capsule, 3 per day)* Ingredients

Dist. by Nature's Way 420 mg (C) APPROVED

NA

Planetary Herbals™ Full Spectrum™ Silymarin 80™ 260 mg (210 mg extract [80% silymarin] and 50 mg organic seed per tablet, 1-2 per day)

Ingredients Dist. by Planetary Formulas 168.7 mg - 337.5 mg (E)2

NOT APPROVED Found only 64% of expected silymarin

NA

Rainbow Light® Milk Thistle Plus™, (500 mg of 4:1 extract [providing 50 mg silymarin] per tablet, 3 per day)

Ingredients Dist. by Rainbow Light Nutritional Systems 150 mg (C)

NOT APPROVED Found only 83.8% of claimed silymarin

Found 1.1 mcg lead per daily serving

Rite Aid Milk Thistle 200 mg (200 mg extract [80% silymarin] per capsule, 1-3 per day)
milk thistle
Ingredients Dist. by Rite Aid Corporation 160 mg - 480 mg (C)
NOT APPROVED Found only 65.8% of claimed silymarin

NA

Trader Darwin's™ Milk thistle 250 (250 mg extract 30:1 [80% silymarin] per capsule, 1-6 per day)
Ingredients Dist. by Trader Joe's 200 mg - 1200 mg (C)
APPROVED

NA

Vitamin World® Silymarin Milk Thistle 1000 mg (250 mg of a 4:1 extract equivalent to 1,000 mg seed per softgel, 1-2 per day)*
Ingredients Dist. by Vitamin World, Inc 15 mg - 30 mg (E)1
APPROVED

NA

Whole Foods™ Standardized Milk Thistle 100 mg (100 mg extract [80% silymarin] per capsule, 4-6 per day)
Ingredients
Dist. by Whole Foods 320 - 480 mg (C)
NOT APPROVED Found only 64% of claimed silymarin

NA

Similar to Approved Products***
Puritan's Pride® Silymarin Milk Thistle 1000 mg (250 mg of a 4:1 extract equivalent to 1,000 mg seed per softgel, 1-2 per day)
Ingredients
Mfd. by Puritan's Pride 15 mg - 30 mg (E) 1

*Tested through CL's Voluntary Certification Program prior to, at time of, or after initial posting of this Product Review.

** Does not meet FDA label requirements. Disqualified from further testing.

*** Product identical in formulation and manufacture to a product that has passed testing but sold under a different brand. For more information see CL's Multi-Label Testing Program.

1 Expected minimum silymarin in seed powder is 1.5% but may contain up to twice that amount.
2 Includes expected minimum silymarin from seed plus claimed 168 mg silymarin from extract per tablet

Unless otherwise noted, information about the products listed above is based on the samples purchased by ConsumerLab.com (CL) for this Product Review. Manufacturers may change ingredients and label information at any time. So be sure to check labels carefully when evaluating the products you use or buy. If a product's ingredients differ from what is listed above, it may not necessarily be the same as what was tested.

The information contained in this report is based on the compilation and review of information from product labeling and analytic testing. CL applies what it believes to be the most appropriate testing methods and standards. The information in this report does not reflect the opinion or recommendation of CL, its officers or employees. CL cannot assure the accuracy of information provided to it by third parties. Liability to any person for any loss or damage caused by errors, omissions, or inaccuracies in this report is hereby disclaimed.

milk thistle

Copyright ConsumerLab.com, LLC, 2007. All rights reserved. Not to be reproduced, excerpted, or cited in any fashion without the express written permission of ConsumerLab.com LLC.

ConsumerTips™:

What to Consider When Buying:

Extracts vs. Seed Powder:

Dry milk thistle seed powder contains only 1.5% to about 3.0% silymarin, while dry "extracts" are much more concentrated – with silymarin accounting for approximately 70% to 80% of their weight. Consequently, pills made from seed powder contain about 9 to 15 mg of silymarin, while pills made from dry extracts contain approximately 112 mg to 240 mg of silymarin, depending on the size of the pill. Be aware, however, that "liquid extracts" are not necessarily concentrated extracts. One liquid extract product tested in this Review indicated that it was made from milk thistle "seed" as opposed to a "seed extract." Products like this are not concentrated – this particular product was expected to contain only 7.5 mg of silymarin per mL (although testing showed it to actually provide less than 2 mg). People who prefer to use whole herb products as opposed to concentrated extracts should be aware that much larger doses of milk thistle will be necessary to get the same amount silymarin.

What to Consider When Using:

The common dosage of milk thistle is 200 mg 2 to 3 times a day of an extract standardized to 70 to 80% silymarin. For diabetics, the 200 mg is taken 3 times a day along with conventional treatment. For cirrhosis of the liver, a daily dose of 420 mg has been used (expected to contain about 300 to 330 mg of silymarin). For chronic active hepatitis, 240 mg of silybinin (the major constituent of silymarin) taken twice daily has been used. (Among the products tested in this review, silybinin was generally found to account for 50% to 75% of the total silymarin.) There is some evidence that preparations containing phosphatidylcholine may increase absorption of active ingredients of milk thistle.

For treatment of mushroom poisoning with Amanita phalloides, 20 mg to 50 mg/kg of silybinin has been administered intravenously over 24 hours, divided into four infusions, each administered over a two hour period. Intravenous silybinin, however, is not available in the U.S.

Additional information about clinical studies with milk thistle is found in the Natural Products Encyclopedia on this website.

Cautions and Concerns:

Milk thistle and its extracts are generally well-tolerated but, infrequently, can have a laxative effect and cause other gastrointestinal side-effects.

Some patients may have allergic reactions to milk thistle including itching, rash, hives, eczema, and anaphylaxis. Allergic reactions may be more likely to occur in patients sensitive to plants such as ragweed, chrysanthemums, marigolds, and daisies.

Although drug interactions have not been reported, milk thistle might reduce the effectiveness of oral contraceptives and it might inhibit cytochrome P450 2C9, increasing the levels of certain drugs metabolized by it such as amitriptyline, diazepam, verapamil, and warfarin.