

Medications That Need Hepatic Monitoring

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Following is a list of drugs, which require hepatic monitoring, and which first appeared in our drug information newsletter. This is not intended to be an all inclusive list but is a result of research and data compiled from our drug information department based on commonly asked questions. Much, if not all of this information, is available in the package insert and other sources of information. There are not any clinical pearls here, it is simply a compilation of most of the drugs where monitoring of liver function tests (LFTs) is recommended. As always, there is a great deal of clinical judgment inherent in deciding when a particular patient needs LFTs; therefore, monitoring depends on the particular patient's needs and circumstances. Readers are welcome to e-mail additions, corrections, deletions, and comments.

TABLE 1

Name	Liver Function Tests	Time Frame for Monitoring	Comments
Cardiovascular Agents			
Atorvastatin (<i>Lipitor</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Also, when treatment is first started or the dose is increased, LFTs should be repeated at 6 and 12 weeks and then every 6 months.	If LFTs are elevated, LFTs should be repeated frequently until they return to normal. If > 3 times the ULN, the dose should be decreased or stopped. CPK should be checked in patients experiencing musculoskeletal pain.
Fluvastatin (<i>Lescol</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Also, at 12 weeks following initiation or elevation of dose.	If LFTs are increased, a second test should be made. LFTs should be repeated until they return to normal. If > 3 times the ULN occur and persist (2 consecutive tests), the drug should be stopped. If weakness, myalgia, or muscle tenderness is present, a CPK should be obtained. If it is increased, the drug should be stopped.
Lovastatin (<i>Mevacor</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Repeated every 6 weeks for the first three months and after dose increases. Thereafter every 6 months.	If LFTs are increased, a second test should be obtained. LFTs should be repeated until they return to normal. If > 3 times the ULN, the drug should be stopped. If weakness, myalgia, or muscle tenderness is present, a CPK should be obtained. If it is increased, the drug should be stopped.
Pravastatin (<i>Pravacol</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Repeated every 6 weeks for the first three months and after dose increases. Then every 6 months.	If LFTs are increased, a second test should be obtained. LFTs should be repeated until they return to normal. If > 3 times the ULN, the drug should be stopped. If weakness, myalgia, or muscle tenderness is present, a CPK should be obtained. If it is increased, the drug should be stopped.
Simvastatin (<i>Zocor</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Repeated semi-annually during the first year or until 1 year after the last dose increase.	Patients taking 80 mg daily, LFTs should also be checked after the first 3 months. If LFTs are increased, a second test should be obtained. LFTs should be repeated until they return to

TABLE 1			
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			normal. If > 3 times the ULN, the drug should be stopped. If weakness, myalgia, or muscle tenderness is present, a CPK should be obtained. If this is > 10 times the ULN, the drug should be stopped.
Gemfibrozil (<i>Lopid</i>)	Serum lipid levels, CBC, and LFTs.	At least every 3 months during the first year and periodically thereafter.	
Clofibrate (<i>Atromid-S</i>)	LFTs (eg, AST, ALT)	Frequent monitoring (time not specified)	If LFTs are increased excessively, the drug should be stopped.
Fenofibrate (<i>Tricor</i>)	LFTs (eg, ALT)	Regular periodic monitoring (time not specified) for duration of therapy	If LFTs are > 3 times the ULN, the drug should be stopped.
Niacin (<i>Niaspan</i>)	LFTs (eg, AST, ALT)	Prior to initiation. Every 6 to 12 weeks for the first year and periodically thereafter (eg, 6 month intervals).	If LFTs are > 3 times the ULN, or if the LFTs are associated with nausea, fever, and/or malaise, the drug should be stopped. IG given with a HMG-CoA, periodic CPK and potassium tests should be made.
Amiodarone (<i>Cordarone</i>)	LFTs (eg, AST, ALT)	Prior to initiation and every 6 months thereafter.	If LFTs are > 3 times the ULN, the dose should be decreased or stopped
Diabetic Agents			
Pioglitazone (<i>Actos</i>)	LFTs (eg, AST, ALT)	Prior to initiation, every 2 months for the first year and periodically thereafter.	
Rosiglitazone (<i>Avandia</i>)	LFTs (eg, AST, ALT, Hg/Hct)	For LFTs, prior to initiation, every 2 months for the first year and periodically thereafter. For Hg/Hct-periodically during therapy.	
Central Nervous System Agents			
Carbamazepine (<i>Tegretol</i>)	LFTs (eg, AST, ALT, CBC including platelets, reticulocytes, and serum iron, serum Na and osmolality, thyroid levels, and complete urinalysis and BUN)	Baseline and periodically for blood test, urinalysis and LFTs.	
Felbamate (<i>Felbatol</i>)	CBC (platelets and reticulocytes) and LFTs (eg, AST, ALT)	CBC should be done prior to initiation, frequently during therapy, and after therapy has ended. LFTs should be done prior to initiation and periodically thereafter.	Serum level monitoring during dosage titration is recommended for patients receiving phenytoin and/or carbamazepine with felbamate. Felbamate may decrease carbamazepine levels and increase phenytoin and valproic acid levels.
Valproic acid (<i>Depakote</i>)	LFTs (eg, AST, ALT)	Prior to initiation of therapy and frequent intervals thereafter (especially during the first six months).	
Ethotoin (<i>Peganone</i>)	Blood counts and LFTs (eg, AST, ALT)	Blood counts should be obtained at monthly intervals for the first several months of therapy. LFTs should be obtained if clinical evidence suggests hepatic dysfunction.	If liver damage is present, the drug should be stopped.
Ethosuximide (<i>Zarontin</i>)	Urinalysis and LFTs (eg, AST, ALT)	Should be done periodically for all patients receiving ethosuximide	
Methsuximide	CBC, urinalysis and	Should be done periodically for all	

TABLE 1

Name	Liver Function Tests	Time Frame for Monitoring	Comments
(<i>Celontin</i>)	LFTs	patient receiving methsuximide	
Oxcarbazepine (<i>Trileptal</i>)	LFTs	Consider doing when patient is displaying toxicity	
Pemoline (<i>Cylert</i>)	LFTs (eg, ALT)	Should be checked every 2 weeks while on the drug.	If ALT is > 2 times the ULN the drug should be stopped.
Nefazodone (<i>Serzone</i>)	LFTs (eg, AST, ALT)	Consider doing when patient is displaying toxicity	If AST or ALT \geq 3 times the ULN the drug should be stopped. At our institution we recommend getting baseline, checking every 3-6 months and if the patient presents with symptoms
Tacrine (<i>Cognex</i>)	LFTs (eg, AST, ALT)	Perform every other week from at least week 4 to week 16 of treatment, and then every 3 months thereafter. If therapy is interrupted for > 4 weeks, LFT monitoring schedule should be resumed when therapy is restarted.	If ALT < 2 times ULN-continue regular schedule. If > 2 and < 3 times ULN-continue and monitor ALT weekly until normal. If > 3 and < 5 times ULN-decrease dose by 40 mg/day. Monitor ALT weekly. Resume dose titration and every other week monitoring when normal. If >5 times ULN-stop drug. Monitor for hepatitis and until normal. May rechallenge in patients with ALT <10 times ULN. If total bilirubin > 3 mg/dl and/or clinical signs/symptoms of hypersensitivity (rash, fever), along with an increase in ALT drug, should be stopped and NOT rechallenged.
Tolcapone (<i>Tasmar</i>)	LFTs	Prior to therapy, every 2 weeks during the first year, every 4 weeks for the next 6 months, and every 8 weeks thereafter.	If dose is increased to 200 mg tid monitor LFTs first and then re-initiated at previous frequency. If LFTs exceed the ULN or if clinical signs/symptoms of hepatic failure appear, the drug should be stopped.
Riluzole (<i>Rilutek</i>)	LFTs, urinalysis, CBC, and routine blood chemistry	Every 2 months during therapy.	If LFTs increase, more frequent monitoring is necessary. If granulocytopenia occurs, the drug must be stopped.
Tizanidine (<i>Zanaflex</i>)	LFTs, renal function tests, serum electrolytes, and CBC with diff	For prolonged therapy measure at baseline, 1, 3, and 6 months and periodically thereafter	
Arthritis Agents			
Oral gold (<i>Auranofin</i>)	CBC with diff, platelet count, urinalysis, renal function and LFTs.	Prior to therapy. CBC with diff, platelet count, and urinalysis every month during therapy.	
Methotrexate (<i>Rheumatrex</i>)	LFTs	At baseline and every 1 to 2 months during therapy.	More frequent monitoring may be needed during antineoplastic therapy, during initial or changing doses or during periods of increased methotrexate levels. LFT abnormalities are usually transient and therapy is not usually modified. LFT abnormalities that are persistent and/or decreased serum albumin require

TABLE 1			
Name	Liver Function Tests	Time Frame for Monitoring	Comments
			evaluation.
Rofecoxib (<i>Vioxx</i>)	LFTs (eg, ALT)	For low risk patients the ALT should be monitored within 3 months of starting treatment and repeated every 6 to 12 months. For high risk patients (eg, > 60 years, renal insufficiency, high dose or prolonged NSAID therapy, or multiple drug use) the ALT should be monitored within the first month of starting treatment and repeated every 3 to 6 months.	If the ALT is > 3 times ULN the drug should be stopped
Diclofenac (<i>Voltaren</i>)	LFTs (eg, ALT)	For low risk patients monitor ALT within 3 months of starting therapy and repeat every 6 to 12 months. For high risk patients (eg, > 60 years, renal insufficiency, high dose or prolonged NSAID use, multiple drug use) within the first month of therapy and repeat every 3 to 6 months.	If ALT is > 3 times the ULN, the drug should be stopped.
Nabumetone (<i>Relafen</i>)	LFTs (eg, ALT)	Monitor ALT for low risk patients within 3 months of starting therapy and repeat every 6 to 12 months. Monitor the ALT within the first month for high risk patients (eg, > 60 years old, renal insufficiency, high dose or prolonged NSAID therapy, multiple drug use) and repeat every 3 to 6 months.	If ALT shows greater than 3 fold elevation, the drug should be stopped.
Valdecoxib (<i>Bextra</i>)	LFTs	Monitor for patients with signs/symptoms of liver dysfunction	If there are signs/symptoms of liver disease, the drug should be stopped.
Meloxicam (<i>Mobic</i>)	LFTs (eg, ALT)	Monitor ALT for low risk patients within 3 months of starting therapy and repeat every 6 to 12 months. Monitor the ALT within the first month of starting treatment for high risk patients (eg, > 60 years old, renal insufficiency, high dose or prolonged NSAID therapy, multiple drug use) and repeat every 3 to 6 months.	If ALT shows greater than 3 fold elevation, the drug should be stopped.
Leflunomide (<i>Arava</i>)	LFTs	At baseline and monthly until stable.	
Tuberculosis Agents			
Isoniazid (<i>Nydrazid</i>)	LFTs	Baseline and monthly.	If LFTs >3 to 5 times the ULN, the drug should be stopped.
Rifampin (<i>Rifadin</i>)	LFTs (eg, AST, ALT)	Monitor prior to therapy and then every 2 to 4 weeks during therapy in patients with impaired renal function.	
Pyrazinamide	LFTs (eg, AST, ALT) and uric acid levels	Prior to therapy and periodically thereafter	If there are signs of hepatocellular damage, the drug should be stopped.
Dapsone	CBC, platelet and reticulocyte counts, LFTs, urinalysis	LFTs and urinalysis every 2 to 3 weeks for the first few weeks	
HIV Agents			
Ritonavir (<i>Norvir</i>)	Serum glucose, triglyceride and	Baseline LFTs, CPK, and uric acid at periodic intervals.	

TABLE 1

Name	Liver Function Tests	Time Frame for Monitoring	Comments
	cholesterol, LFTs (eg, AST, ALT, GGTP, CPK and uric acid)		
Indinavir (<i>Crixivan</i>)	LFTs, renal function test, CBC with diff and routine blood chemistry	Every 2 to 4 weeks	
Lamivudine (<i>Epivir</i>)	LFTs, renal function test, and CBC	Periodically during therapy	
Nevirapine (<i>Viramune</i>)	LFTs, renal function tests, CBC, and routine blood chemistry	Periodically during therapy	
Efavirenz (<i>Sustiva</i>)	LFTs, cholesterol levels, and routine blood chemistry	Routine	
Antibiotic/Antifungal Agents			
Griseofulvin (<i>Fulvicin P/G</i>)	Renal, LFTs, and hematopoietic	Periodic monitoring while on prolonged therapy	
Itraconazole (<i>Sporanox</i>)	LFTs	Periodic monitoring if patients on greater than one month, or at any time patients develops signs and symptoms of liver dysfunction	Should be monitored for patients with pre-existing hepatic function abnormalities or those who have had liver toxicity with other medications
Ketoconazole (<i>Nizoral</i>)	LFTs (eg, GGTP/ Alk phos, AST, ALT, and bilirubin)	Prior to therapy and at frequent intervals during therapy	The drug should be stopped if there are transient minor elevations in liver enzymes that are persistent.
Terbinafine (<i>Lamisil</i>)	LFTs	Prior to therapy and periodically if drug therapy persists longer than 4 to 6 weeks	If liver dysfunction develops the drug should be stopped.
Chemotherapy Agents			
Tretinoin (<i>Vesanoid</i>)	LFTs	During treatment	If LFTs > 5 times the ULN, the drug should be temporarily stopped.
Gemtuzumab (<i>Mylotarg</i>)	LFTs	When patient shows signs of toxicity.	
Imatinib (<i>Gleevec</i>)	LFTs (eg, GGTP/Alk phos and bilirubin)	Prior to therapy and monthly or as clinically indicated.	Stop drug if bilirubin >3 times ULN or LFTs > 5 times ULN. Re-institute at lower daily dose when bilirubin is < 1.5 times ULN and LFTs < 2.5 times ULN
Flutamide (<i>Eulexin</i>)	LFTs	At the first sign/symptom of liver dysfunction (eg, pruritus, dark urine, persistent anorexia, jaundice, RUQ tenderness, or unexplained “flu-like” symptoms)	The drug should be stopped if the patients has clinically evident jaundice in the absence of biopsy-confirmed liver metastases or if the LFTs are > 2 to 3 times the ULN.
Miscellaneous Agents			
Ribavirin/Interferon alfa (<i>Rebetron</i>)	LFTs	When patients are toxic	
Ribavirin (<i>Rebetol</i>)	LFTs, TSH, platelets, CBC with diff	When patients are toxic. Also, prior to start of treatment and periodically thereafter.	
Tazarotene (<i>Tazorac gel</i>)	Routine blood chemistries including transaminases	Suggested during long-term therapy	
Testosterone (<i>Androgel</i>)	LFTs, PSA, cholesterol, and HDL	Suggested periodically	
Bosentan (<i>Tracleer</i>)	Routine blood chemistries including	When patients are toxic	

TABLE 1			
Name	Liver Function Tests	Time Frame for Monitoring	Comments
	transaminases		
Succimer (<i>Chemet</i>)	LFTs	Prior to therapy and weekly thereafter.	Mild and transient elevations have been noted
Azathioprine (<i>Imuran</i>)	CBC with platelets and LFTs	LFTs should be monitored every 2 weeks for the first 4 weeks and monthly thereafter	
Acetaminophen (<i>Tylenol</i>)	LFTs	In overdose and chronic use or overuse in patients predisposed to liver toxicity	
Pentamidine (<i>Pentam</i>)	Daily BUN and Scr, daily blood glucose, CBC and platelet count, LFTs (eg, bilirubin, Alk phos, AST, ALT), calcium, and EKG	Prior to, during, and after therapy.	
Albendazole (<i>Albenza</i>)	CBC with diff and LFTs	At beginning of each 28 day cycle and every 2 weeks while on therapy	If tests are not WNL, a subsequent treatment cycle should not be started.

TABLE 2	
List of Abbreviations	
<i>Abbreviation</i>	<i>Definition</i>
Alk Phos	Alkaline Phosphatase
ALT	Alanine transaminase (same as SGOT)
AST	Aspartate transaminase (same as SGPT)
BUN	Blood urea nitrogen
CBC	Complete blood count
CPK	Creatine phosphokinase (BB, MB, MM are isoenzymes)
EKG	Electrocardiogram
GGT	Gamma-glutamyl transferase
HDL	High-density lipoprotein
HMG CoA	Hepatic hydroxymethyl glutamyl coenzyme A
LFT	Liver function test
NSAID	Non-steroidal anti-inflammatory drug
ULN	Upper limits of normal

TABLE 3	
Index	
<i>Generic Name/Brand Name</i>	<i>Table Heading</i>
Acetaminophen- <i>Tylenol</i>	Miscellaneous
Albendazole- <i>Albenza</i>	Miscellaneous
Amiodarone- <i>Cordarone</i>	Cardiovascular
<i>Androgel</i> -Testosterone	Miscellaneous
Atorvastatin- <i>Lipitor</i>	Cardiovascular
Azathioprine- <i>Imuran</i>	Miscellaneous
<i>Bextra</i> -Valdecoxib	Arthritis
Bosentan- <i>Tracleer</i>	Miscellaneous
Carbamazepine- <i>Tegretol</i>	Central Nervous System
Clofibrate- <i>Atromid S</i>	Cardiovascular
Dapsone	Tuberculosis
Diclofenac- <i>Voltaren</i>	Arthritis
Efavirenz- <i>Sustiva</i>	HIV

Ethosuximide- <i>Zarontin</i>	Central Nervous System
Ethotoin- <i>Peganone</i>	Central Nervous System
Felbamate- <i>Felbatol</i>	Central Nervous System
Fenofibrate- <i>Tricor</i>	Cardiovascular
Flutamide- <i>Eulexin</i>	Chemotherapy
Fluvastatin- <i>Lescol</i>	Cardiovascular
Gemfibrozil- <i>Lopid</i>	Cardiovascular
Gemtuzumab- <i>Mylotarg</i>	Chemotherapy
<i>Gleevec</i> -Imatinib	Chemotherapy
Griseofulvin- <i>Fulvicin P/G</i>	Antibiotic/Antifungal
Imatinib- <i>Gleevec</i>	Chemotherapy
Indinavir- <i>Crixivan</i>	HIV
Isoniazid- <i>Nydrazid</i>	Tuberculosis
Itraconazole- <i>Sporanox</i>	Antibiotic/Antifungal
Ketoconazole- <i>Nizoral</i>	Antibiotic/Antifungal
Lamivudine- <i>Epivir</i>	HIV
Leflunomide- <i>Arava</i>	Arthritis
Lovastatin- <i>Mevacor</i>	Cardiovascular
Meloxicam- <i>Mobic</i>	Arthritis
Methotrexate- <i>Rheumatrex</i>	Arthritis
Methsuximide- <i>Celontin</i>	Central Nervous System
Nabumetone- <i>Relafen</i>	Arthritis
Nevirapine- <i>Viramune</i>	HIV
Nefazodone- <i>Serzone</i>	Central Nervous System
Niacin- <i>Niaspan</i>	Cardiovascular
Oral Gold- <i>Auranofin</i>	Arthritis
Oxcarbazepine- <i>Trileptal</i>	Central Nervous System
Pemoline- <i>Cylert</i>	Central Nervous System
Pentamidine- <i>Pentam</i>	Miscellaneous
Pioglitazone- <i>Actos</i>	Diabetic
Pravastatin- <i>Pravacol</i>	Cardiovascular
Pyrazinamide	Tuberculosis
<i>Rebetol</i> -Ribavirin	Miscellaneous
<i>Relafen</i> -Nabumetone	Arthritis
Ribavirin- <i>Rebetol</i>	Miscellaneous
Ribavirin/Interferon alfa- <i>Rebetron</i>	Miscellaneous
Rifampin- <i>Rifadin</i>	Tuberculosis
Riluzole- <i>Rilutek</i>	Central Nervous System
Ritonavir- <i>Norvir</i>	HIV
Rofecoxib- <i>Vioux</i>	Arthritis
Rosiglitazone- <i>Avandia</i>	Diabetic
<i>Serzone</i> -Nefazodone	Central Nervous System
Simvastatin- <i>Zocor</i>	Cardiovascular
<i>Sporanox</i> -Itraconazole	Antibiotic/Antifungal
Succimer- <i>Chemet</i>	Miscellaneous
Tacrine- <i>Cognex</i>	Central Nervous System
<i>Tazarac gel</i> -Tazarotene	Miscellaneous
Tazarotene- <i>Tazarac gel</i>	Miscellaneous
Terbinafine- <i>Lamisil</i>	Antibiotic/Antifungal
Testosterone- <i>Androgel</i>	Miscellaneous
Tizanidine- <i>Zanaflex</i>	Central Nervous System
Tolcapone- <i>Tasmar</i>	Central Nervous System
<i>Tracleer</i> -Bosentan	Miscellaneous
Tretinoin- <i>Vesanoid</i>	Chemotherapy

<i>Tricor</i> -Fenofibrate	Cardiovascular
Valdecoxib- <i>Bextra</i>	Arthritis
Valproic Acid- <i>Depakote</i>	Central Nervous System
<i>Tylenol</i> (see Acetaminophen)	Miscellaneous
<i>Zanaflex</i> -Tizanidine	Central Nervous System
<i>Albenza</i> (see Albendazole)	Miscellaneous
<i>Cordarone</i> (see Amiodarone)	Cardiovascular
<i>Lipitor</i> (see Atorvastatin)	Cardiovascular
<i>Imuran</i> (see Azathioprine)	Miscellaneous
<i>Tegretol</i> (see Carbamazepine)	Central Nervous System
<i>Baycol</i> (see Cerivastatin)	Cardiovascular
<i>Atromid S</i> (see Clofibrate)	Cardiovascular
<i>Voltaren</i> (see Diclofenac)	Arthritis
<i>Sustiva</i> (see Efavirenz)	HIV
<i>Zarontin</i> (see Ethosuximide)	Central Nervous System
<i>Peganone</i> (see Ethotoin)	Central Nervous System
<i>Felbatol</i> (see Felbamate)	Central Nervous System
<i>Eulexin</i> (see Flutamide)	Chemotherapy
<i>Lescol</i> (see Fluvastatin)	Cardiovascular
<i>Lopid</i> (see Gemfibrozil)	Cardiovascular
<i>Mylotarg</i> (see Gemtuzumab)	Chemotherapy
<i>Fulvicin P/G</i> (see Griseofulvin)	Antibiotic/Antifungal
<i>Crixivan</i> (see Indinavir)	HIV
<i>Nydrazid</i> (see Isoniazid)	Tuberculosis
<i>Nizoral</i> (see Ketoconazole)	Antibiotic/Antifungal
<i>Epivir</i> (see Lamivudine)	HIV
<i>Arava</i> (see Leflunomide)	Arthritis
<i>Mevacor</i> (see Lovastatin)	Cardiovascular
<i>Mobic</i> (see Meloxicam)	Arthritis
<i>Rheumatrex</i> (see Methotrexate)	Arthritis
<i>Celontin</i> (see Methsuximide)	Central Nervous System
<i>Viramune</i> (see Nevirapine)	HIV
<i>Niaspan</i> (see Niacin)	Cardiovascular
<i>Auranofin</i> (see Oral Gold)	Arthritis
<i>Trileptal</i> (see Oxcarbazepine)	Central Nervous System
<i>Cylert</i> (see Pemoline)	Central Nervous System
<i>Pentam</i> (see Pentamidine)	Miscellaneous
<i>Actos</i> (see Pioglitazone)	Diabetic
<i>Pravacol</i> (see Pravastatin)	Cardiovascular
<i>Rebetron</i> (see Ribavirin/Interferon alfa)	Miscellaneous
<i>Rifadin</i> (see Rifampin)	Tuberculosis
<i>Rilutek</i> (Riluzole)	Central Nervous System
<i>Norvir</i> (Ritonavir)	HIV
<i>Vioxx</i> (see Rofecoxib)	Arthritis
<i>Avandia</i> (see Rosiglitazone)	Diabetic
<i>Zocor</i> (see Simvastatin)	Cardiovascular
<i>Chemet</i> (see Succimer)	Miscellaneous
<i>Cognex</i> (see Tacrine)	Central Nervous System
<i>Lamisil</i> (see Terbinafine)	Antibiotic/Antifungal
<i>Tasmar</i> (see Tolcapone)	Central Nervous System
<i>Vesanoid</i> (see Tretinoin)	Chemotherapy
<i>Depakote</i> (see Valproic Acid)	Central Nervous System

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