[1]Fluoroquinolone Genotoxicity
Selected Gene Identification and Associated Health Conditions

Gene Mutated Regulated	Chromosome	Gene Process	Associated Maladies	Reference Information
MLL	11q23	Lysine (K)-Specific Methyltransferase 2A	Leukima, lymphoma	1
DFFB	1p36.3	DNA Fragmentation Factor, 40kDa, Beta Polypeptide	Polyarteritis, epilepticus	2
TARDBP	1p36.22	TAR DNA Binding Protein	Polyglucosan Body Disease, dementia, Amyotrophic Lateral Sclerosis	3
AGMAT	1p36.21	Agmatine Ureohydrolase (Agmatinase)	Mood Disorder	4
DIRAS3	1p31	DIRAS Family, GTP-Binding RAS-Like 3	endometriosis	5
GPR177	1p31.3	Wntless Wnt Ligand Secretion Mediator	Focal dermal hypoplasia,	6
GBP1,2,3	1p22.2	Guanylate Binding Protein 1	Multiple Sclerosis, and Epstein-Barr Syndrome	
PHGDH	1p12	Phosphoglycerate Dehydrogenase	Neuronitis	
PRUNE	1q21.3	Prune Exopolyphosphatase	Necrotizing Gastritis is related to *peptic ulcer*.	
CFHR2, 5	1q31.3	Complement Factor H-Related 2	Kuhnt-Junius Degeneration, *macular degeneration*	7
SPTBN1	2p21	Spectrin, Beta, Non-Erythrocytic 1	Neurofibromatosis, Sjogren	8
RY1	2p13.3	Small Nuclear Ribonucleoprotein 27kDa (U4/U6.U5)	Malignant hyperthermia Syndrome - muscle wasting	9
MAT2A	2p11.2	Methionine Adenosyltransferase II	Metabolic Disorder, Nutritional Disorder, amino acids metabolization disorders	
REV1L	2q11.1-11.2	REV1, Polymerase (DNA Directed	Premature aging – Werner's Syndrome	10
PNKD	2q35	Paroxysmal Nonkinesigenic Dyskinesia	Hypokinesia refers to decreased bodily movement. It is associated with basal ganglia diseases (such as Parkinson's disease), mental health disorders and prolonged inactivity due to illness, amongst other diseases. Synonyms: movement disease, movement disorder, movement syndrome	11

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DNAJB2	2q32-34	DnaJ (Hsp40) Homolog, Subfamily B	Neuronal and Muscular Disease – Muscular Atrophy, Motor Neuropathy, Muscle wasting	
USP19	3p21.31	Ubiquitin Peptidase Ubiquitin Specific Peptidase 19[1]	Hypoxia, and Muscle wasting	12
RNF123	3p24.3	Ubiquitination-Promoting Complex Protein	Depression, Chron's Disease	
DCTN4	5q3-32	Dynactin 4	Becker Muscular Dystrophy, Muscle-skeletal wasting, weakness	13
HIST1H2BD	6p22.1	H2B Histone Family, Member B	Lupus	
PHIP	6q14.1	Pleckstrin Homology Domain Interacting Protein	Legg-Calve Disease - Legg-calve-perthes disease Collagen and Connective Tissue Disease	14
NSUN5B	7q11.23	NOP2/Sun Domain Family, Member 5 Pseudogene	Williams-Beuren Syndrome	15
BRI3	7q21.3	Brain Protein I3	dementia	
CLN8	8p23.3	Ceroid-Lipofuscinosis, Neuronal 8	Cerebral atrophy, Gauchers Disease	16
ENDOG	9q34.11	Endonuclease G	Polyploidy, Chromosomal Damage - Breakage	
SEC24C	10q22.2	SEC24 Family Member C[1]	Alzheimer's disease (ad)	
MBD6	12q13.2	Methyl-CpG Binding Domain Protein 6	Retts Syndrome, nervous system and joints	17
PXMP2	12q24.33	Peroxisomal Membrane Protein 2, 22kDa	Parkinson	
NDRG2	14q.11.2	NDRG Family Member 2	Motor peripheral neuropathy, neuropathy	
CROP	17q21.33	LUC7-Like 3 (S. Cerevisiae)	Narcolepsy - sleep disorder	18
GAMT	19p13.3	Guanidinoacetate N-Methyltransferase	Movement Disease, intellectual disabilities	11, 19
GPI	19q13.11	Glucose-6-Phosphate Isomerase	Arthritis, dentine erosion, (see list below)	20
CYP2A6 CYP2B7P1 CYP2B6	19q13.2	Cytochrome P450, Family 2, Subfamily A, Polypeptide [6]	Detoxification inabilities, drug metabolization inabilities	21
RELB	19q13.32	V-Rel Avian Reticuloendotheliosis Viral Oncogene Homolog B	*acute respiratory syndrome*, and *neurologic diseases*.	22
SFRS16	19q13.3	CLK4-Associating Serine/Arginine Rich Protein	*Neurological, ataxia*	23
GYS1	19q13.3	Glycogen [Starch] Synthase, Muscle Glycogen Synthase 1 (Muscle)	*Muscle wasting-weakness* - myopathies are neuromuscular disorders	23,24
H1F0	22q13.1	H1 Histone Family, Member 0	Cockayne syndrome is a rare condition which causes short stature, premature aging (progeria), severe photosensitivity, and moderate to severe learning delay.	25
ARSA	22q13.33	Arylsulfatase A, cerebroside-sulfatase	Neuropathy, Sneddon Syndrome – Neurological	26

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1). Infant Leukemia: Finding the Needle in the Haystack
Logan G. Spector and Julie A. Ross, Division of Pediatric Epidemiology and Clinical Research, Department of Pediatrics, University of Minnesota, Minneapolis, Minnesota [*Cancer Epidemiol Biomarkers Prev* 2006;15:2331].

2). GeneCards

3). **NIH Rare Diseases:** Polyglucosan body disease is a slowly progressive metabolic disorder. It is caused by excessive accumulation of polyglucosan bodies in tissues, including nerve, muscle, liver, kidney, and lung. The disease can cause neurogenic bladder, dementia, loss of feeling in the lower limbs, and upper and lower motor neuron dysfunction. A variety of different biochemical defects may cause polyglucosan body disease. Glycogen branching enzyme (gbe) deficiency has been identified as the cause in some patients. Treatment of people with polyglucosan body disease is generally supportive, addressing symptoms such as walking impairment, incontinence, and dementia. Last updated: 12/2/2008.

4). **MedlinePlus:** Most people feel sad or irritable from time to time. They may say they're in a bad mood. A mood disorder is different. It affects a person's everyday emotional state. These include major depressive disorder dysthymic disorder (a chronic, mild depression) bipolar disorder (also called manic depression) mood disorders can increase a person's risk for heart disease, diabetes, and other diseases. Treatments include medication, psychotherapy, or a combination of both. With treatment, most people with mood disorders can lead productive lives.

5). **MedlinePlus:** Endometriosis is a problem affecting a woman's uterus - the place where a baby grows when she's pregnant. endometriosis is when the kind of tissue that normally lines the uterus grows somewhere else. it can grow on the ovaries, behind the uterus or on the bowels or bladder. rarely, it grows in other parts of the body. this "misplaced" tissue can cause pain, infertility, and very heavy periods. the pain is usually in the abdomen, lower back or pelvic areas. some women have no symptoms at all. having trouble getting pregnant may be the first sign. the cause of endometriosis is not known. pain medicines and hormones often help. severe cases may need surgery. there are also treatments to improve fertility in women with endometriosis.

6). **NIH Rare Diseases:** Focal dermal hypoplasia is a genetic disorder that primarily affects the skin, skeleton, eyes, and face. most individuals with this condition are female. males usually have milder signs and symptoms than females. although intelligence is typically unaffected, some individuals have intellectual disability. this condition is caused by mutations in the porcn gene and is inherited in an x-linked dominant manner. most cases of focal dermal hypoplasia in females result from new mutations in the porcn gene and occur in people with no history of the disorder in their family. when focal dermal hypoplasia occurs in males, it always results from a new mutation in this gene that is not inherited. last updated: 9/23/2011.
MalaCards: Chronic Intestinal Vascular Insufficiency, also known as *chronic mesenteric ischemia*, is related to *ischemia* and *mesenteric artery ischemia*

7). NIH Rare Diseases: Atypical hemolytic-uremic syndrome (ahus) is a disease that causes abnormal blood clots to form in small blood vessels in the kidneys. these clots can cause serious medical problems if they restrict or block blood flow, including hemolytic anemia, thrombocytopenia, and kidney failure. it can occur at any age and is often caused by a combination of environmental and genetic factors. genetic factors involve genes that code for proteins that help control the complement system (part of your body's immune system). environmental factors include certain medications (such as anticancer drugs).

8). **MedlinePlus:** Neurofibromatosis is a genetic disorder of the nervous system. it mainly affects how nerve cells form and grow. it causes tumors to grow on nerves. you can get neurofibromatosis from your parents, or it can happen because of a mutation (change) in your genes. once you have it, you can pass it along to your children. usually the tumors are benign, but sometimes they can become cancerous. there are three types of neurofibromatosis: type 1 (nf1) causes skin changes and deformed bones. it usually starts in childhood. sometimes the symptoms are present at birth. type 2 (nf2) causes hearing loss, ringing in the ears, and poor balance. symptoms often start in the teen years. schwannomatosis causes intense pain. it is the rarest type. doctors diagnose the different types based on the symptoms. genetic testing is also used to diagnose nf1 and nf2. there is no cure. treatment can help control symptoms. depending on the type of disease and how bad it is, treatment may include surgery to remove tumors, radiation therapy, and medicines. nih: national institute of neurological disorders and stroke

MalaCards: Neurofibromatosis, also known as *von recklinghausen disease*, is related to *neurofibroma* and *malignant peripheral nerve sheath tumor*, and has symptoms including *lisch nodules/iris hamartomas*, *proptosis/exophthalmos* and *arterial stenosis/occlusion*. An important gene associated with Neurofibromatosis is *NF1* (neurofibromin 1), and among its related pathways are *Development HGF signaling pathway* and *Signaling by FGFR*. The compounds *tyrosine* and *phosphatidylinositol* have been mentioned in the context of this disorder. Affiliated tissues include *brain*, *skin* and *spinal cord*, and related mouse phenotypes are *homeostasis/metabolism* and *normal*

9). **NIH Rare Diseases:** Malignant hyperthermia is a severe reaction to particular drugs used during surgery and other invasive procedures. people at increased risk for this disorder are said to have malignant hyperthermia susceptibility. if given these drugs, these people may experience muscle rigidity, breakdown of muscle fibers, a high fever, increased acid levels in the blood and other tissues, and a rapid heart rate. without prompt treatment, the complications of malignant hyperthermia can be life-threatening. there are at least six forms of malignant hyperthermia susceptibility, which are associated with mutations in different genes (e.g., cacna1s, ryr1). the susceptibility is inherited in an autosomal dominant fashion. people with certain inherited muscle diseases (e.g., central core disease and multiminicore disease) also have malignant hyperthermia susceptibility. last updated: 4/4/2011.

10). **NIH Rare Diseases:** Werner's syndrome is a disease chiefly characterized by premature aging and cancer predisposition. development is typically normal until the end of the first decade; the first sign is the lack of a growth spurt during puberty. early signs (usually in the 20s) include loss and graying of hair, hoarseness, and scleroderma-like skin changes, followed by cataracts, type 2 diabetes mellitus, hypogonadism, skin ulcers, and osteoporosis in the 30s. myocardial infarction (heart attack) and cancer are the most common causes of death, which typically occurs in the late 40s. it is caused by mutations in the wrn gene and is inherited in an autosomal recessive manner. management focuses on treatment of signs and symptoms and prevention of secondary complications. last updated: 4/29/2011.

11). **Genetics Home Reference:** Familial paroxysmal nonkinesigenic dyskinesia is a disorder of the nervous system that causes periods of involuntary movement. Paroxysmal indicates that the abnormal movements come and go over time. Nonkinesigenic means that episodes are not triggered by sudden movement. Dyskinesia broadly refers to involuntary movement of the body.

12). **UniProtKB/Swiss-Prot:** UBP19_HUMAN, O94966 **Function**: Deubiquitinating enzyme that regulates the degradation of various proteins. Deubiquitinates and prevents proteasomal degradation of RNF123 which in turn stimulates CDKN1B ubiquitin-dependent degradation thereby playing a role in cell proliferation. Involved in decreased protein synthesis in atrophying skeletal muscle. Modulates transcription of major myofibrillar proteins.

13). **NIH Rare Diseases:** Becker muscular dystrophy (bmd) is an inherited condition that primarily affects males and causes progressive weakness and wasting of the skeletal and cardiac (heart) muscles. the age of onset and rate of progression can vary among affected people. muscle weakness usually becomes apparent between the ages of 5 and 15. in some cases, heart involvement (cardiomyopathy) is the first sign. bmd is caused by a mutation in the dmd gene and is inherited in an x-linked recessive manner. bmd is very similar to duchenne muscular dystrophy, except that symptoms begin later and progress at a slower rate. there is no cure for this condition, and treatment aims to relieve symptoms to help quality of life. people with bmd may survive into their 40s or beyond. last updated: 3/5/2014.

Becker Muscular Dystrophy, also known as *muscular dystrophy, becker type*, is related to *muscular dystrophy* and *duchenne muscular dystrophy*. An important gene associated with Becker Muscular Dystrophy is *DMD* (dystrophin), and among its related pathways are *Striated Muscle Contraction* and *Cytoskeleton remodeling Neurofilaments*. The compounds *alpha-bungarotoxin* and *succinate* have been mentioned in the context of this disorder. Affiliated tissues include *heart*, *testes* and *brain*, and related mouse phenotypes are *growth/size* and *muscle*.

14). **NIH Rare Diseases:** Legg-calve-perthes disease occurs when the ball of the thighbone in the hip doesnâ□™t get enough blood, causing the bone to die. early symptoms may include mildly painful limp, pain down the inner thigh to the knee, some restriction of hip movement, pain at extremes of movement, and tenderness over the hip joint. treatment may include a brief period of bed rest (1 to 3 days) followed by bracing. rarely bracing may be required for 2 to 3 years. chance of recovery (prognosis) varies, but tends to be better for younger patients (e.g., less than 6 years of age). some people with this syndrome go on to

develop degenerative arthritis. the cause of the condition is unknown. last updated: 1/6/2011

MalaCards: Legg-Calve-Perthes Disease, also known as *perthes disease*, is related to *collagen disease* and *vascular disease*, and has symptoms including *short stature/dwarfism/nanism*, *polygenic/multifactorial inheritance* and *cartilage destruction/chondrolysis*. An important gene associated with Legg-Calve-Perthes Disease is *COL2A1* (collagen, type II, alpha 1), and among its related pathways are *Common Pathway* and *Platelet activation, signaling and aggregation*. The compounds *warfarin* and *sarpogrelate hydrochloride* have been mentioned in the context of this disorder. Affiliated tissues include *hip joint* and *bone*, and related mouse phenotype *liver/biliary system*. **Disease Ontology:** An osteochondrosis that results in death and fracture located in hip joint.

15). **MalaCards:** Williams-Beuren Syndrome, also known as *williams syndrome*, is related to *williams syndrome* and *supravalvular aortic stenosis*, and has symptoms including *biliary/gallbladder stones/lithiasis/cholecystitis*, *malabsorption/chronic diarrhea/steatorrhea* and *gastroesophageal reflux/pyrosis/esophagitis/hiatal hernia/gastroparesia*. An important gene associated with Williams-Beuren Syndrome is *BAZ1B* (bromodomain adjacent to zinc finger domain, 1B). Affiliated tissues include *kidney*, *bone* and *skin*.

16). **NINDS:** Cerebral atrophy is a common feature of many of the diseases that affect the brain. Atrophy of any tissue means loss of cells. In brain tissue, atrophy describes a loss of neurons and the connections between them. Atrophy can be generalized, which means that all of the brain has shrunk; or it can be focal, affecting only a limited area of the brain and resulting in a decrease of the functions that area of the brain controls. If the cerebral hemispheres (the two lobes of the brain that form the cerebrum) are affected, conscious thought and voluntary processes may be impaired.

MalaCards: Cerebral Atrophy is related to *dementia* and *hydrocephalus*. An important gene associated with Cerebral Atrophy is *SEPSECS* (Sep (O-phosphoserine) tRNA:Sec (selenocysteine) tRNA synthase), and among its related pathways are *Regulation of innate immune responses to cytosolic DNA* and *Lagging Strand Synthesis*. The compounds *cycloheximide* and *tacrine* have been mentioned in the context of this disorder. Affiliated tissues include *brain*, and related mouse phenotypes are *renal/urinary system* and *muscle*. **MedlinePlus:**[33] Gaucher's disease is a rare, inherited disorder in which you do not have enough of an enzyme called glucocerebrosidase. this causes too much of a fatty substance to build up in your spleen, liver, lungs, bones and, sometimes, your brain. this prevents these organs from working properly. there are three types: type 1, the most common form, causes liver and spleen enlargement, bone pain and broken bones, and, sometimes, lung and kidney problems. it does not affect the brain. it can occur at any age. type 2, which causes severe brain damage, appears in infants. most children who have it die by age 2. in type 3, there may be liver and spleen enlargement. the brain is gradually affected. it usually starts in childhood or adolescence. gaucher's disease has no cure. treatment options for types 1 and 3 include medicine and enzyme replacement therapy, which is usually very effective. there is no good treatment for the brain damage of types 2 and 3. nih: national institute of neurological disorders and stroke

17). MedlinePlus: Rett syndrome is a rare genetic disease that causes developmental and nervous system problems, mostly in girls. it's related to autism. babies with rett syndrome seem to grow and develop normally at first. between 3 months and 3 years of age, though, they stop developing and even lose some skills. symptoms include loss of speech loss of hand movements such as grasping compulsive movements such as hand wringing balance problems breathing problems behavior problems learning problems or intellectual disability rett syndrome has no cure. you can treat some of the symptoms with medicines, surgery, and physical and speech therapy. most people with rett syndrome live into middle age and beyond. they will usually need care throughout their lives. nih: national institute of child health and human development

MalaCards: Rett Syndrome, also known as *rett's disorder*, is related to *breast cancer* and *leukemia*, and has symptoms including *restricted joint mobility/joint stiffness/ankylosis*, *thin/hypoplastic/hyperconvex fingernails* and *clinodactyly of fifth finger*. An important gene associated with Rett Syndrome is *MECP2* (methyl CpG binding protein 2 (Rett syndrome)), and among its related pathways are *Sympathetic Nerve Pathway (Pre- and Post- Ganglionic Junction)* and *NGF-independant TRKA activation*. The compounds *acetyl-l-carnitine* and *estrogen* have been mentioned in the context of this disorder. Affiliated tissues include *brain*, *bone* and *lung*, and related mouse phenotypes are *taste/olfaction* and *integument*.

Disease Ontology: A pervasive developmental disease that is a neurological and developmental disorder that mostly occurs in females and is caused by a mutation on the mecp2 gene on the x chromosome. infants with rett syndrome seem to grow and develop normally at first, but then stop developing and even lose skills and abilities.

18). NIH Rare Diseases: Narcolepsy is a sleep disorder that causes episodes of extreme daytime sleepiness. three other major symptoms frequently characterize narcolepsy: cataplexy, or the sudden loss of voluntary muscle tone; vivid hallucinations during sleep onset or upon awakening; and brief episodes of sleep paralysis. the disorder is estimated to affect about one in every 2,000 americans. most cases of narcolepsy are sporadic, which means that the condition occurs in one person in a family and is not inherited. however, up to 10 percent of individuals with narcolepsy have a close relative with the same symptoms. other factors may be involved in causing narcolepsy, such as infection, immune-system dysfunction, trauma, hormonal changes, stress. last updated: 3/9/2011

MalaCards: Narcolepsy, also known as *narcolepsy-cataplexy syndrome*, is related to *sleep disorder* and *obesity*, and has symptoms including *somnolence/hypersomnia/parasomnia*, *delirium/hallucination* and *psychic/behavioural troubles*. An important gene associated with Narcolepsy is *HCRT* (hypocretin (orexin) neuropeptide precursor), and among its related pathways are *Class A/1 (Rhodopsin-like receptors)* and *Alcoholism*. The drugs *methylphenidate* and *methylphenidate hydrochloride* and the compounds *acetylcholine* and *glutamate* have been mentioned in the context of this disorder. Affiliated tissues include *brain*, *eye* and *testes*, and related mouse phenotypes are *behavior/neurological* and *nervous system*.
Disease Ontology: A sleep disorder that involves an excessive urge to sleep at inappropriate times, such as while at work.
Genetics Home Reference: Narcolepsy is a chronic sleep disorder that disrupts the normal sleep-wake cycle.
NINDS: Narcolepsy is a chronic neurological disorder caused by the brain's inability to regulate sleep-wake cycles normally.

19). An amino acid metabolic disorder that has_material_basis_in a mutation in the GATM gene resulting in deficiency of arginine:glycine amidinotransferase which then limits creatine synthesis. Hypokinesia refers to decreased bodily movement. It is associated with basal ganglia diseases (such as Parkinson's disease), mental health disorders and prolonged inactivity due to illness, amongst other diseases. A specific developmental disorder that involves significant limitations both in mental functioning and in adaptive behavior such as communicating, taking care of him or herself, and social skills.

20). Intestinal vascular inefficiency, dentine erosion, root caries, rheumatoid arthritis, arthritis, parkinson's, alzheimer's, lupus, diabetes, leukemia.

21). This gene, CYP2A6, encodes a member of the cytochrome P450 superfamily of enzymes. The cytochrome P450 proteins are monooxygenases which catalyze many reactions involved in drug metabolism and synthesis of cholesterol, steroids and other lipids.

22). **MedlinePlus:** The brain, spinal cord, and nerves make up the nervous system. together they control all the workings of the body. when something goes wrong with a part of your nervous system, you can have trouble moving, speaking, swallowing, breathing, or learning. you can also have problems with your memory, senses, or mood. there are more than 600 neurologic diseases. major types include diseases caused by faulty genes, such as huntington's disease and muscular dystrophy problems with the way the nervous system develops, such as spina bifida degenerative diseases, where nerve cells are damaged or die, such as parkinson's disease and alzheimer's disease diseases of the blood vessels that supply the brain, such as stroke injuries to the spinal cord and brain seizure disorders, such as epilepsy cancer, such as brain tumors infections, such as meningitis

MalaCards: Neurologic Diseases is related to *parkinson's disease* and *prion disease*. An important gene associated with Neurologic Diseases is *CNTF* (ciliary neurotrophic factor), and among its related pathways are *Disease* and *Nanog in Mammalian ESC Pluripotency*. The compounds *threonine* and *bio* have been mentioned in the context of this disorder. Affiliated tissues include *brain*, *spinal cord* and *heart*.

23). **NINDS:** Ataxia often occurs when parts of the nervous system that control movement are damaged. People with ataxia experience a failure of muscle control in their arms and legs, resulting in a lack of balance and coordination or a disturbance of gait. While the term ataxia is primarily used to describe this set of symptoms, it is sometimes also used to refer to a family of disorders. It is not, however, a specific diagnosis.

MalaCards: Ataxia is related to *spinocerebellar ataxia* and *cerebellar ataxia*. An important gene associated with Ataxia is *ATXN2* (ataxin 2), and among its related pathways are *Cyclins and Cell Cycle Regulation* and *DNA Damage Induced 14-3-3Sigma Signaling*. The compounds *glutamine* and *vitamin-e* have been mentioned in the context of this disorder. Affiliated tissues include *cerebellum*, and related mouse phenotypes are *nervous system* and *behavior/neurological*.

24). **GeneCards Summary for GYS1 Gene: GYS1** (glycogen synthase 1 (muscle)) is a protein-coding gene. Diseases associated with **GYS1** include *glycogen storage disease type 0, muscle*, and *glycogen storage disease type 0*. GO annotations related to this gene include *protein kinase binding* and *glycogen (starch) synthase activity*.

NINDS: The myopathies are neuromuscular disorders in which the primary symptom is muscle weakness due to dysfunction of muscle fiber. Other symptoms of myopathy can include include muscle cramps, stiffness, and spasm. Myopathies can be inherited (such as the muscular dystrophies) or acquired (such as common muscle cramps). Myopathies are grouped as follows:: characterized by developmental delays in motor skills; skeletal and facial abnormalities are occasionally evident at birth: characterized by progressive weakness in voluntary muscles; sometimes evident at birth: caused by genetic abnormalities in mitochondria, cellular structures that control energy; include Kearns-Sayre syndrome, MELAS and MERRF: caused by mutations in genes controlling enzymes that metabolize glycogen and glucose (blood sugar); include Pompe's, Andersen's and Cori's diseases: caused by disorders in the metabolism of a fuel (myoglobin) necessary for muscle work; include McArdle, Tarui, and DiMauro diseases: an inflammatory myopathy of skin and muscle: characterized by bone growing in muscle tissue: characterized by episodes of weakness in the arms and legs: inflammatory myopathies of skeletal muscle: characterized by alternating episodes of twitching and stiffness; and

MalaCards: Myopathy is related to *nemaline myopathy* and *centronuclear myopathy*. An important gene associated with Myopathy is *ACTA1* (actin, alpha 1, skeletal muscle), and among its related pathways are *Striated Muscle Contraction* and *Rho Family GTPases*. The compounds *calcium* and *creatinine* have been mentioned in the context of this disorder. Affiliated tissues include *skeletal muscle*, *bone* and *skin*, and related mouse phenotypes are *behavior/neurological* and *muscle*.

25). **NIH Rare Diseases:** Cockayne syndrome is a rare condition which causes short stature, premature aging (progeria), severe photosensitivity, and moderate to severe learning delay. this syndrome also includes failure to thrive in the neonate, microcephaly, and impaired nervous system development. other symptoms may include hearing loss, tooth decay, and eye and bone abnormalities. cockayne syndrome type 1 (type a) is sometimes called â□œclassicâ□□ cockayne syndrome and is diagnosed during early childhood. cockayne syndrome type 2 (type b) is sometimes referred to as the â□œconnatalâ€• type. this type is a more severe form in which growth and developmental abnormalities are present at birth. the third type, cockayne syndrome type 3 (type c) is a milder form of the disorder. cockayne syndrome is caused by mutations ineither the ercc8 (csa) or ercc6 (csb) genes and is inherited in an autosomal recessive pattern. individuals with type 1 or 2 usually do not survive past childhood, whereas those with type 3 live into adulthood. last updated: 5/31/2011

26). **NIH Rare Diseases:** Sneddon syndrome is a progressive condition characterized by livedo reticularis (bluish net-like patterns of discoloration on the skin) and neurological abnormalities. symptoms may include headache, dizziness, high blood pressure, heart disease, mini-strokes and/or stroke. reduced blood flow to the brain may cause lesions to develop within the central nervous system. this can lead to reduced mental capacity, memory loss and other neurological symptoms. the exact cause of sneddon syndrome is unknown. some familial cases have been described. it has also been associated with obliterating vasculitis and antiphospholipid antibody syndrome. last updated: 2/22/2012.

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Sources:

Research article: **Topoisomerase II inhibition involves characteristic chromosomal expression patterns**
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Conclusion: We suggest topoisomerase II inhibition by Aroclor 1254, **trovafloxacin**, doxorubicin, and etoposide to be responsible for significant co-localization of regulated genes through the inability of the stabilized enzyme complexes to religate DNA. Within the permanently opened chromatin domains, neighbored genes might be allowed to be regulated. Overexpression of c-myc, however, does not inhibit topoisomerase II activity. Consequently, the enzyme is able to perform its normal function of transiently breaking and rejoining the DNA double strand. As a result, exclusively target genes are regulated.

Additional File 1
Lists of genes significantly deregulated after treatment with Aroclor1254, trovafloxacin, doxorubicin, etoposide and after overexpression of c-myc*. Exclusively genes possessing a RefSeq accession number were listed. The regulated genes whose TSSs are located within 100 kbp and their corresponding expression values are marked yellow. The file clearly shows that these gene pairs do not show similar expression levels. In many cases transcriptionally induced as well as transcriptionally repressed genes occur within 100 kbp.*
Click here for file [http://www.biomedcentral.com/content/supplementary/1471-2164-9-324-S1.xls]

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Gene Cards (www.genecards.org)

MalaCards, Life Map Sciences, National Institute of Health (NIH)

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