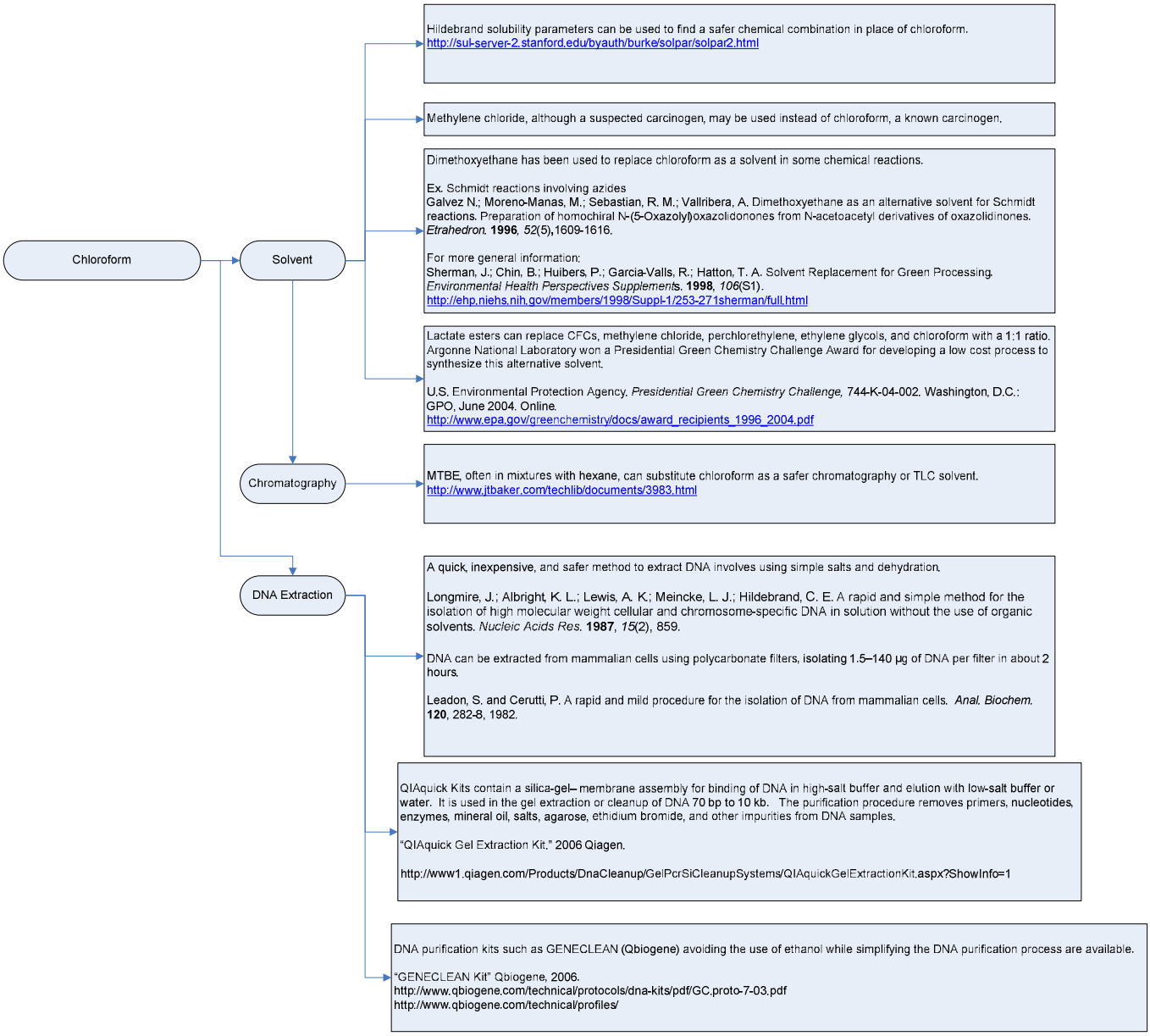
Chloroform
Solvent
Hildebrand solubility parameters can be used to find a safer chemical combination in place of chloroform.
http://sul-server-2.stanford.edu/byauth/burke/solpar/solpar2.html
Methylene chloride, although a suspected carcinogen, may be used instead of chloroform, a known carcinogen.
Dimethoxyethane has been used to replace chloroform as a solvent in some chemical reactions.
Ex. Schmidt reactions involving azides
Galvez N.; Moreno-Manas, M.; Sebastian, R. M.; Vallribera, A. Dimethoxyethane as an alternative solvent for Schmidt reactions. Preparation of homochiral N-(5-Oxazolyl)oxazolidonones from N-acetoacetyl derivatives of oxazolidinones. Etrahedron. 1996, 52(5),1609-1616.
For more general information:
Sherman, J.; Chin, B.; Huibers, P.; Garcia-Valls, R.; Hatton, T. A. Solvent Replacement for Green Processing. Environmental Health Perspectives Supplements. 1998, 106(S1).
http://ehp.niehs.nih.gov/members/1998/Suppl-1/253-271sherman/full.html
Lactate esters can replace CFCs, methylene chloride, perchlorethylene, ethylene glycols, and chloroform with a 1:1 ratio. Argonne National Laboratory won a Presidential Green Chemistry Challenge Award for developing a low cost process to synthesize this alternative solvent.
U.S. Environmental Protection Agency. Presidential Green Chemistry Challenge, 744-K-04-002. Washington, D.C.: GPO, June 2004. Online.
http://www.epa.gov/greenchemistry/docs/award_recipients_1996_2004.pdf
Chromatography
MTBE, often in mixtures with hexane, can substitute chloroform as a safer chromatography or TLC solvent.
http://www.jtbaker.com/techlib/documents/3983.html
DNA Extraction
A quick, inexpensive, and safer method to extract DNA involves using simple salts and dehydration.
Longmire, J.; Albright, K. L.; Lewis, A. K.; Meincke, L. J.; Hildebrand, C. E. A rapid and simple method for the isolation of high molecular weight cellular and chromosome-specific DNA in solution without the use of organic solvents. Nucleic Acids Res. 1987, 15(2), 859.
DNA can be extracted from mammalian cells using polycarbonate filters, isolating 1.5–140 µg of DNA per filter in about 2 hours.
Leadon, S. and Cerutti, P. A rapid and mild procedure for the isolation of DNA from mammalian cells. Anal. Biochem. 120, 282-8, 1982.
QIAquick Kits contain a silica-gel– membrane assembly for binding of DNA in high-salt buffer and elution with low-salt buffer or water. It is used in the gel extraction or cleanup of DNA 70 bp to 10 kb. The purification procedure removes primers, nucleotides, enzymes, mineral oil, salts, agarose, ethidium bromide, and other impurities from DNA samples.
"QIAquick Gel Extraction Kit." 2006 Qiagen.
http://www1.qiagen.com/Products/DnaCleanup/GelPcrSiCleanupSystems/QIAquickGelExtractionKit.aspx?ShowInfo=1
DNA purification kits such as GENECLEAN (Qbiogene) avoiding the use of ethanol while simplifying the DNA purification process are available.
"GENECLEAN Kit" Qbiogene, 2006.
http://www.qbiogene.com/technical/protocols/dna-kits/pdf/GC.proto-7-03.pdf
http://www.qbiogene.com/technical/profiles/