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```
function initSelector(element){ $('.skiptocontent').removeAttr("href"); $( element ).parent().before( "" );  
window.location.hash = '#top'; $(window).scrollTop($("#top").offset().top-100);  
window.location.hash=''; } $('#skiptocontent').keydown(function (e) { var code; try { code =  
(window.event) ? window.event.keyCode : event.which; } catch(err) { code = e.keyCode || e.which; }  
//click Enter if(code == 13){ var mainPagId=$("#main-page-content").text(); if(mainPagId){  
initSelector('#main-page-content'); }else{ var firstH1=$('#h1:first').text(); if(firstH1){  
initSelector('h1:first'); }else{ $('#skiptocontent').css('display','none'); } } }});
```

showDfpAd(0)

\$(document).on("ready", sageQuickSearch.init('chpc'));

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```
$(document).on("ready", sageQuickSearch.init('chpc'));
```

[Advanced](#)

Sign In

National Science Library

Society

```
addClass('enhancedLoginPanel', 'doNotShow'); function initLoginBox() { if (hasPersonIdentity())  
$('.profileContainerMobile img.loggedInArrow').show(); else { $('.profileContainerMobile  
img.loggedInArrow').hide(); //$('.myprofile-label').text("Sign In"); }; $('#portalLoginBar .sage-login-  
widget').attr('tabindex', '0'); $('.sage-login-widget img.user-logo').each(function(){  
//console.log($(this).attr('src')); if($(this).attr('src').indexOf('templates')==-1)
```

```
$(this).addClass('bannerImage'); else $(this).removeClass('bannerImage');}); initMyProfileInfo();  
initInstitutionInfo(); initSocietyInfo(); if (inPbEditorMode()) $('.sage-login-widget').attr('onclick',  
'toggleLoginPopup(true);return false;'); if (isIE()) { $("img.user-logo").each(function () { let imgUrl =  
$(this).prop("src"); if (imgUrl) { $(this).css("backgroundImage", 'url(' + imgUrl + ')').addClass("ie-object-  
fit"); $(this).prop("src","");
}); } ); } }
```

Access Options

You can be signed in via any or all of the methods shown below at the same time.

My Profile

Sign in here to access free tools such as favourites and alerts, or to access personal subscriptions

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Password (required)

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I don't have a profile

[Create Profile](#)

I am signed in as:

[View My Account](#)

[Logout](#)

```
function initMyProfileInfo() { $('.id-person-activated>img.user-logo').attr('title', 'You are signed in via your profile'); $('.id-person-deactivated>img.user-logo').attr('title', 'You are not signed in via your profile'); $('#frmLogin br').hide(); $('#user-login-form #passwordReminder').insertBefore('#user-login-form #frmLogin tr:last-child'); $('
Set new password
').appendTo('#user-login-form #passwordReminder'); $('#ru-user').attr('href', '/action/doLogout?redirectUri=' + window.location.href); $('#user-login-form .loginForm label[for="password"]').append(':'); if (hasPersonIdentity()) { $('#user-info').show(); $('#user-login-form').hide(); } else { $('#user-info').hide(); $('#user-login-form').show(); } let $user=$('#portalLoginBar .my-profile-col.id-person-activated'); if ($user && $user.attr('name') && $user.attr('name').length>0) { $('
'+$user.attr('name')+'
').appendTo('#user-name'); } }
```

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Institution

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[Open Athens](#)

I am signed in via:

National Science Library

```
function setInstitutionLoginStatus() { let samlExists=($('.access-via-samel').length)>0; let  
appendTag=""; if (samlExists) { appendTag+='  
';  
}; } else { appendTag+='  
';
```

Signed in via: **a federated identity**

Sign in via: [Shibboleth](#)

Sign in via: [Open Athens](#)

```
'; } $('#inst-login-status').append(appendTag); } function setRedirectUrl() { let currentUrl =  
window.location.pathname; $('.Shibboleth').attr("href", $('.Shibboleth').attr('href') + currentUrl);  
$('.OpenAthens').attr("href", $('.OpenAthens').attr('href') + currentUrl); } function initInstitutionInfo() {  
setInstitutionLoginStatus(); setRedirectUrl(); if ($('.id-institution-activated>img.user-  
logo').attr('title')===undefined) $('.id-institution-activated>img.user-logo').attr('title', 'You are signed in
```

```
via your institution'); $('.id-institution-deactivated>img.user-logo').attr('title', 'You are not signed in via  
an institution'); $('#institution-info .portallInstitutionalButton').after('
```

my institutional subscription

```
'); //if ($('#institution-info .portallInstitutionalButton a').length) $('#institution-info .portallInstitutionalButton  
a').text(); if (hasInstitutionIdentity()) { $('#institution-info').show(); $('#institution-login-form').hide(); }  
else { $('#institution-info').hide(); $('#institution-login-form').show(); } }
```

With institutional access I can:

- View or download all content the institution has subscribed to.

Society

If you have access to journal via a society or associations, read the instructions below

Members of _ can log in with their society credentials below

Username (required)

Password (required)

Society (required)

Access to society journal content varies across our titles.

If you have access to a journal via a society or association membership, please browse to your society journal, select an article to view, and follow the instructions in this box.

Contact us if you experience any difficulty logging in.

Some society journals require you to create a personal profile, then activate your society account

[Activate my Society Account](#)

I am signed in via:

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[Logout](#)

```
function getYmCount() { let rv=0; try{ rv=Number("0"); if (isNaN(rv)) rv=0; } catch (e) {} return rv; }
function getSocietyJournals(index) { let rv=""; try { switch (index) { case 1:rv=""; break; case 2:rv=""; break; case 3:rv=""; break; case 4:rv=""; break; case 5:rv=""; break; default:break; } } catch (e) {}
return rv; }
```

```
$('#ru-society').attr('href', '/action/doLogout?redirectUri=' + window.location.href); function
restyleJournalAd(){ if ($('#society-login-form .literatumAd').length!==0) { $('#society-login-form
#society-info-text, #society-login-form .topSeparator').hide(); } } function initSocietyInfo() { if ($('.id-
society-activated>img.user-logo').attr('title')===undefined) $('.id-society-activated>img.user-
logo').attr('alt', 'You are signed in via your society'); $('.id-society-deactivated>img.user-
logo').attr('title', 'You are not signed in via a society'); $('#society-info .portallnsitutionalButton').after('
```

my society or association

```
'); if (hasSocietyIdentity()){ $('#society-info').show(); $('#society-login-form').hide(); } else {
restyleJournalAd(); $('#society-info').hide(); $('#society-login-form').show(); } } function
getYmSocietyIndex(){ let count = getYmCount() || 0; let currentJournal = "chp"; if
(currentJournal.length!==0 && count>0) { console.log("Looking through "+count+" societies for journal
code: "+currentJournal); for (i=0; i
```

—

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```
if ('0.4822.7201.098CiteScoreSCImago Journal Rank (SJR)151563'.trim().length>0)
$('.impactFactorContainer').removeClass('not-show-important'); if ($( ".impact-factor-container" ) &&
$( ".impact-factor-container" ).size()>0) $("#showAllSocietiesBtn").addClass("ifBorder"); switch
($("#showNoFoldedSocietyLogos .societyImageLink").size()) { case 2:
$("#showNoFoldedSocietyLogos").addClass('two-logos'); break; case 1:
$("#showNoFoldedSocietyLogos").addClass('one-logo'); break; case 0: default: break; } function
resizeHeaderFont() { var headerTitleElement = document.getElementById('headerTitle'); if
(headerTitleElement) { var fontsize = 32; if ("'" && "FALSE" === "TRUE") fontsize=28;
$("#headerTitle").css('font-size', fontsize+"px"); /*Max font size, then reduce from there*/
$("#headerTitle h1").css('font-size', fontsize+"px"); /*Max font size, then reduce from there - journal
home only*/ var headerTitleSize = headerTitleElement.getBoundingClientRect(); var textHeight =
headerTitleSize.height; var textWidth = headerTitleSize.width; var containerElement =
document.getElementById('headerTitleContainer'); var containerSize =
containerElement.getBoundingClientRect(); var containerHeight = containerSize.height; var
containerWidth = containerSize.width; var fontstring = ""; while (textHeight > containerHeight) {
fontsize--; fontstring = fontsize.toString(); fontstring = fontstring + "px"; $('#headerTitle').css('font-size',
fontstring); $('#headerTitle h1').css('font-size', fontstring); headerTitleSize =
headerTitleElement.getBoundingClientRect(); textHeight = headerTitleSize.height; textWidth =
headerTitleSize.width; } } }; resizeHeaderFont(); $(window).resize(function() { resizeHeaderFont(); });
```

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 - [Feedback](#)
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```
function offset(el) { let rect = el.getBoundingClientRect(), scrollLeft = window.pageXOffset ||
document.documentElement.scrollLeft, scrollTop = window.pageYOffset ||
document.documentElement.scrollTop; return { top: rect.top + scrollTop, left: rect.left + scrollLeft,
bottom: rect.bottom + scrollTop , right: rect.right + scrollLeft } } window.addEventListener("scroll",
function() { let y = window.pageYOffset; let $quickSearchId = $("#journalQuickSearch").parent(); if (y
>= offset(document.getElementById("portalQuickSearch")).bottom) {
$quickSearchId.removeClass("doNotShow"); } else { $quickSearchId.addClass("doNotShow"); } } );
```

```
$(document).on("ready", sageQuickSearch.init('chpc'));
```

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```
$("#accept-cookie-policy").click(function() { $.get('/action/cookiePolicy?response=accept',  
function(data) { $(".cookiePolicy").remove(); }});});
```

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```
_ $(document).ready(function() { if( ($('#openAccessSideMenu .showFullText').size() == 0) ||  
    (isDesktop() && $('#openAccessSideMenu').find('.noAccess').size() !=0 ) ) {  
    $('#mobileContents').closest('.general-html-asset').addClass('hide');  
    $('.mobileToolLink').addClass('double-button'); } } );
```

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```
var script = document.createElement('script'); script.type='text/javascript';
script.src='//s7.addthis.com/js/250/addthis_widget.js#pubid=xa-4faab26f2cff13a7'; script.async = true;
$('head').append(script)
```

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All fields are required

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```
$(document).ready(function () { if ($.articleTools .rightsLink").length) {  
    $(".permissionsToolContainer").css("display", "inherit"); } });
```

```
$(`div.articleToolsLinks`).insertBefore(`li.RelatedArticles`); `div.pdf-no-access a`).removeAttr('href');  
$("#copyToClipBoard").attr('data-item-name', 'copy-citation'); $("#articleCitationDownloadContainer,  
#articleShareContainer, #articlePermissionsContainer").click(function () { articleToolsToggle(); });  
$(".popup-dialog").on("click", function(event){ event.stopPropagation();}); `').  
insertAfter('#copyToClipBoard'); trapKeys('.popup-dialog', '.articleToolPanelClose');
```

—

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```
function addFlashMovie(id, flv) { var flashvars = {file: flv ,type: 'flv'}; var params = {allowfullscreen :true}; var attributes = {};  
swfobject.embedSWF('/flvplayer.swf', id, "352", "288", "7.0.0", false,  
flashvars, params, attributes); }  
function addFlashMovie(id, flv, image) { var flashvars = {file: flv ,type:  
'flv', image: image}; var params = {allowfullscreen :true}; var attributes = {};  
swfobject.embedSWF('/flvplayer.swf', id, "352", "288", "7.0.0", false, flashvars, params, attributes); }
```

Folic Acid: Beyond Metabolism

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/* * Check the number of Author's * if less than '3' we not display expandable-author * */ var numItems = \$('.contribDegrees').length; if(numItems

Keywords [folate](#), [MTHFR](#), [photoperiod](#), [ultraviolet](#), [pteroylmonoglutamic acid](#), [homocysteine](#), [folic acid](#), [glutathione](#)

Lucock MD Folic acid: nutritional biochemistry, molecular biology and role in disease processes. Mol Genet Metab. 2000;71: 121-138.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Selhub J. Folate, vitamin B12 and vitamin B6 and one carbon metabolism. J Nutr Health Aging. 2002;6:39-42.

[Google Scholar](#) | [Medline](#)

Smith AD , Kim YI , Refsum H. Is folic acid good for everyone? Am J Clin Nutr. 2008;87:517-533.

[Google Scholar](#) | [Medline](#) | [ISI](#)

Lucock MD , Yates ZR Folic acid fortification: a double-edged sword. Curr Opin Clin Nutr Metab Care. 2009;12:555-564.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

MRC Vitamin Study Research Group. Prevention of neural tube defects: results of the Medical Research Council Vitamin Study. Lancet. 1991;338:131-137.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Selhub J. Homocysteine metabolism. Annu Rev Nutr. 1999 ;19: 217-246.

Schorah CJ , Devitt H. , Lucock M. , Dowell AC
The responsiveness of plasma homocysteine to
small increases in dietary folic acid: a primary care
study. Eur J Clin Nutr. 1998;52:407-411.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock MD Synergy of genes and nutrients: the
case of homocysteine. Curr Opin Clin Nutr Metab
Care. 2006;9:748-756.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Collin SM , Metcalfe C. , Refsum H. , et al.
Circulating folate, vitamin B12, homocysteine,
vitamin B12 transport proteins, and risk of prostate
cancer: a case-control study, systematic review,
and meta-analysis. Cancer Epidemiol Biomarkers
Prev. 2010;19: 1632-1642.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Hirsch S. , Sanchez H. , Albala C. , et al. Colon
cancer in Chile before and after the start of the
flour fortification program with folic acid. Eur J
Gastroenterol Hepatol. 2009;21:436-439.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Yajnik CS , Deshpande SS , Jackson AA , et al.
Vitamin B12 and folate concentrations during
pregnancy and insulin resistance in the offspring:
the Pune Maternal Nutrition Study. Diabetologia.
2008;51:29-38.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Halsted CH Perspectives on obesity and
sweeteners, folic acid fortification and vitamin D
requirements. Fam Pract. 2008;25: i44-i49.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Troen AM , Mitchell B. , Sorensen B. , et al.
Unmetabolized folic acid in plasma is associated
with reduced natural killer cell cytotoxicity among
postmenopausal women. J Nutr. 2006;136:189-
194.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Bailey SW , Ayling JE The extremely slow and
variable activity of dihydrofolate reductase in
human liver and its implications for high folic acid
intake. Proc Natl Acad Sci U S A. 2009;106:

Eaton SB The ancestral human diet: what was it and should it be a paradigm for contemporary nutrition? *Proc Nutr Soc.* 2006;65: 1-6.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Cordain L. , Eaton SB , Sebastian A. , et al. Origins and evolution of the Western diet: health implications for the 21st century. *Am J Clin Nutr.* 2005 ;81:341-354.

[Google Scholar](#) | [Medline](#) | [ISI](#)

Bell CG , Walley AJ , Froguel P. The genetics of human obesity. *Nat Rev Genet.* 2005;6:221-234.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lowell WE , Davis GE Jr. The light of life: evidence that the sun modulates human lifespan . *Med Hypotheses.* 2008;70: 501-507.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Marzullo G. , Fraser F. Similar rhythms of seasonal conceptions in neural tube defects and schizophrenia: a hypothesis of oxidant stress and the photoperiod. *Birth Defects Res.* 2005; 73(ptA):1-5.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

Torrey E. , Miller J. , Rawlings R. , Yolken R. Seasonality of births in schizophrenia and bipolar disorders: a review of the literature. *Schizophr Res.* 1997;28:1-38.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock M. , Glanville T. , Ovadia L. , Yates Z. , Walker J. , Simpson N. Photoperiod at conception predicts C677T-MTHFR genotype: a novel gene-environment interaction. *Am J Hum Biol.* 2010;22: 484-489.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Templer D. , Trent N. , Spencer D. , et al. Season of birth in multiple sclerosis. *Acta Neurol Scand.* 1992;85:107-109.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Bayes HK , Weir CJ , O'Leary C. Timing of birth and risk of multiple sclerosis in the Scottish

population . Eur Neurol. 2010;63: 36-40.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Brenner A. , Linet M. , Shapiro W. , et al. Season of birth and risk of brain tumors in adults.

Neurology. 2004;63:276-281.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Chotai J. , Serretti A. , Lattuada E. , Lorenzi C. , Lilli R. Gene-environment interaction in psychiatric disorders as indicated by season of birth variations in tryptophan hydroxylase (TPH), serotonin transporter (5-HTTLPR) and dopamine receptor (DRD4) gene polymorphisms. Psychiatry Res. 2003;119:99-111.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Eisenberg DT , Campbell B. , Mackillop J. , Lum JK , Wilson DS Season of birth and dopamine receptor gene associations with impulsivity, sensation seeking and reproductive behaviors . PLoS One. 2007 ;2(11):e1216.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gavrilov L. , Gavrilova N. Season of birth and human longevity . J Anti-aging Med. 1999;2: 365-366.

[Google Scholar](#) | [Crossref](#)

Juckett D. , Rosenberg B. Correlation of human longevity oscillations with sunspot cycles. Radiat Res. 1993;133:312-320.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Doblhammer G. , Vaupel J. Lifespan depends on month of birth . Proc Natl Acad Sci U S A. 2001;98:2934-2939.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Foster RG , Roenneberg T. Human responses to the geophysical daily, annual and lunar cycles . Curr Biol. 2008;18:R784-R794.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

van der Put NM , Steegers-Theunissen RP , Frosst P. , et al. Mutated methylenetetrahydrofolate reductase as a risk factor for spina bifida. Lancet. 1995;346:1070-1071.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Muntjewerff JW , Hoogendoorn ML , Kahn RS , et al. Hyperhomocysteinemia, methylenetetrahydrofolate reductase 677TT genotype, and the risk for schizophrenia: a Dutch population based case-control study. Am J Med Genet B Neuropsychiatr Genet. 2005;135B:69-72.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Crow TJ , Ball J. , Bloom SR , et al. Schizophrenia as an anomaly of development of cerebral asymmetry. A postmortem study and a proposal concerning the genetic basis of the disease . Arch Gen Psychiatry. 1989;46:1145-1150.

[Google Scholar](#) | [Crossref](#) | [Medline](#)

Marzullo G. , Fraser FC Conception season and cerebral asymmetries among American baseball players: implications for the seasonal birth effect in schizophrenia. Psychiatry Res. 2009;167:287-293.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock M. , Yates Z. , Glanville T. , Leeming R. , Simpson N. , Daskalakis I. A critical role for B-vitamin nutrition in human developmental and evolutionary biology. Nutr Res. 2003;23: 1463-1475.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

Jablonski NG , Chaplin G. Colloquium paper: human skin pigmentation as an adaptation to UV radiation. Proc Natl Acad Sci U S A . 2010 ;107:8962-8968.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Blount BC , Mack MM , Wehr CM , et al. Folate deficiency causes uracil misincorporation into human DNA and chromosome breakage: implications for cancer and neuronal damage. Proc Natl Acad Sci U S A. 1997;94:3290-3295.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock M. , Yates Z. , Ng X. , et al. Preliminary evidence for genetic selection of 677T-MTHFR by natural cycle of folate abundance. J Nutrigenet Nutrigenomics . 2008;1:24-29.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gluckman PD , Hanson MA , Cooper C. , Thornburg KL Effect of in utero and early-life

conditions on adult health and disease. *N Engl J Med.* 2008;359:61-73.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Schibler U. The daily rhythms of genes, cells and organs: Biological clocks and circadian timing in cells. *EMBO Rep.* 2005;6: S9-S13.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Kavakli IH , Sancar A. Circadian photoreception in humans and mice. *Mol Interv.* 2002;2:484-492.

[Google Scholar](#) | [Crossref](#) | [Medline](#)

Wolf G. Three vitamins are involved in regulation of the circadian rhythm . *Nutr Rev.* 2002;60: 257-260.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Jablonski NG , Chaplin G. The evolution of human skin coloration . *J Hum Evol.* 2000;39:57-106.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Jablonski NG The evolution of human skin and skin colour . *Annu Rev Anthropol.* 2004;33:585-623.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

Lao O. , de Gruijter JM , van Duijn K. , Navarro A. , Kayser M. Signatures of positive selection in genes associated with human skin pigmentation as revealed from analyses of single nucleotide polymorphisms . *Ann Hum Genet.* 2007;71: 354-369.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Rees JL The genetics of sun sensitivity in humans. *Am J Hum Genet.* 2004;75:739-751.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Graf J. , Hodgson R. , van Daal A. Single nucleotide polymorphisms in the MATP gene are associated with normal human pigmentation variation. *Hum Mutat.* 2005 ;25:278-284.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Donaldson KO , Keresztesy JC Naturally occurring forms of folic acid. III. Characterization and properties of 5-methyldihydrofolate, an oxidation product of 5-methyltetrahydrofolate. *J*

Biol Chem. 1962;237:3815-3819.

[Google Scholar](#) | [Medline](#) | [ISI](#)

Ratanasthien KR , Blair JA , Leeming RJ , Cooke WT , Melikian V. Serum folates in man. J Clin Pathol. 1977;30:438-448.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock MD , Priestnall M. , Daskalakis I. , Schorah CJ , Wild J. , Levene MI Nonenzymatic degradation and salvage of dietary folate: physicochemical factors likely to influence bioavailability. Biochem Mol Med . 1995;55:43-53.

[Google Scholar](#) | [Crossref](#) | [Medline](#)

Ng X. , Lucock M. , Veysey M. Physicochemical effect of pH and antioxidants on mono and triglutamate forms of 5-methyltetrahydrofolate, and evaluation of vitamin stability in human gastric juice: implications for folate bioavailability. Food Chem. 2008;106:200-210.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

Lucock M. , Yates Z. , Cade A. Gastro-intestinal pH modulates facile interconversion of native formylfolates during absorption. Pteridines. 2001;12:60.

[Google Scholar](#)

Juzeniene A. , Thu Tam TT , Iani V. , Moan J. 5-Methyltetrahydrofolate can be photodegraded by endogenous photosensitizers. Free Radic Biol Med. 2009;47:1199-1204.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gambicher T. , Bader A. , Sauermann K. , Altmeyer P. , Hoffmann K. Serum folate levels after ultraviolet-A exposure: a two-group parallel randomised controlled trial. BMC Dermatol. 2001;1:8.

[Google Scholar](#) | [Crossref](#) | [Medline](#)

Ravanat JL , Douki T. , Cadet J. Direct and indirect effects of UV radiation on DNA and its components . J Photochem Photobiol B. 2001;63:88-102.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Tornaletti S. , Hanawalt PC Effect of DNA lesions on transcription elongation . Biochimie. 1999

;81:139-146.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Hori T. , Ayusawa D. , Shimizu K. , Koyama H. , Seno T. Chromosome breakage induced by thymidylate stress in thymidylate synthase-negative mutants of mouse FM3A cells. *Cancer Res.* 1984 ;44:703-709.

[Google Scholar](#) | [Medline](#) | [ISI](#)

Fox JT , Shin WK , Caudill MA , Stover PJ A UV-responsive internal ribosome entry site enhances serine hydroxymethyl-transferase 1 expression for DNA damage repair. *J Biol Chem.* 2009;284: 31097-31108.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Fritz G. , Kaina B. Activation of c-Jun N-terminal kinase 1 by UV irradiation is inhibited by wortmannin without affecting c-jun expression. *Mol Cell Biol.* 1999;19:1768-1774.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Bender K. , Blattner C. , Knebel A. , Iordanov M. , Herrlich P. , Rahmsdorf HJ UV-induced signal transduction. *J Photochem Photobiol B.* 1997 ;37:1-17.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Deng J. , Harding HP , Raught B. , et al. Activation of GCN2 in UV-irradiated cells inhibits translation . *Curr Biol.* 2002;12: 1279-1286.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Jiang HY , Wek RC GCN2 phosphorylation of eIF2alpha activates NF-kappaB in response to ultraviolet irradiation. *Biochem J.* 2005 ;385:371-380.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Wu S. , Hu Y. , Wang JL , Chatterjee M. Ultraviolet light inhibits translation through activation of the unfolded protein response kinase PERK in the lumen of the endoplasmic reticulum. *J Biol Chem.* 2002;277:18077-18083.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gebauer F. , Hentze MW Molecular mechanisms of translational control. *Nat Rev Mol Cell Biol.* 2004;5:827-835.

Laiho M. , Latonen L. Cell cycle control, DNA damage checkpoints and cancer. Ann Med. 2003;35:391-397.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lucock M. , Yates Z. Folic acid-vitamin and panacea or genetic time bomb? Nat Rev Genet. 2005;6:235-240.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Muñoz-Moran E. , Dieguez-Lucena JL , Fernandez-Arcas N. , Peran-Mesa S. , Reyes-Engel A. Genetic selection and folate intake during pregnancy. Lancet . 1998;352:1120-1121.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Reyes-Engel A. , Muñoz E. , Gaitan MJ , et al. Implications on human fertility of the 677C->T and 1298A->C polymorphisms of the MTHFR gene: consequences of a possible genetic selection. Mol Hum Reprod. 2002;8: 952-957.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gueant JL , Gueant-Rodriguez R-M. , Forges T. , et al. Letter to the editor. Am J Clin Nutr. 2006;84:1244-1245.

[Google Scholar](#)

Mayor-Olea A. , Callejón G. , Palomares AR , et al. Human genetic selection on the MTHFR 677C->T polymorphism. BMC Med Genet. 2008;9:104.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Botto LD , Yang Q. 5,10-Methylenetetrahydrofolate reductase gene variants and congenital anomalies: a HuGE review. Am J Epidemiol. 2000;151:862-877.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Rosenberg N. , Murata M. , Ikeda Y. , et al. The frequent 5,10-methylenetetrahydrofolate reductase C677T polymorphism is associated with a common haplotype in whites, Japanese, and Africans. Am J Hum Genet. 2002 ;70:758-762.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Wilcken B. , Bamforth F. , Li Z. , et al.
Geographical and ethnic variation of the
677C->T allele of 5,10
methylenetetrahydrofolate reductase (MTHFR):
findings from over 7000 newborns from 16 areas
worldwide. *J Med Genet.* 2003;40: 619-625.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Wouters MG , Boers GH , Blom HJ , et al.
Hyperhomocysteinemia: a risk factor in women
with unexplained recurrent early pregnancy loss.
Fertil Steril. 1993;60:820-825.
[Google Scholar](#) | [Medline](#) | [ISI](#)

Nelen WL , Steegers EA , Eskes TK , Blom HJ
Genetic risk factor for unexplained recurrent early
pregnancy loss . *Lancet.* 1997;350: 861.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gris JC , QuÃ©rÃ© I. , Monpeyroux F. , et al.
Case-control study of the frequency of
thrombophilic disorders in couples with late foetal
loss and no thrombotic antecedent-the NÃ©mes
Obstetricians and Haematologists Study 5
(NOHA5). *Thromb Haemost.* 1999;81: 891-899.
[Google Scholar](#) | [Medline](#) | [ISI](#)

Isotalo PA , Wells GA , Donnelly JG Neonatal
and fetal methylenetetrahydrofolate reductase
genetic polymorphisms: an examination of C677T
and A1298C mutations. *Am J Hum Genet.*
2000;67:986-990.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Waterland RA , Jirtle RL Early nutrition,
epigenetic changes at transposons and imprinted
genes, and enhanced susceptibility to adult
chronic diseases . *Nutrition.* 2004;20:63-68.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Gluckman PD , Hanson MA , Buklijas T. , Low
FM , Beedle AS Epigenetic mechanisms that
underpin metabolic and cardiovascular diseases.
Nat Rev Endocrinol. 2009;5:401-408.
[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Vanaerts LA , Blom HJ , Deabreu RA , et al.
Prevention of neural tube defects by and toxicity of
L-homocysteine in cultured postimplantation rat
embryos . *Teratology.* 1994;50:348-360.

Mosharov E. , Cranford MR , Banerjee R. The quantitatively important relationship between homocysteine metabolism and glutathione synthesis by the transsulfuration pathway and its regulation by redox changes. *Biochemistry* . 2000;39:13005-13011.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Wenstrom KD , Johanning GL , Owen J. , Johnston KE , Acton S. , Tamura T. Role of amniotic fluid homocysteine level and of fetal 5,10-methylenetetrahydrafolate reductase genotype in the etiology of neural tube defects. *Am J Med Genet*. 2000 ;90: 12-16.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Cederberg J. , Galli J. , Luthman H. , Eriksson UJ Increased mRNA levels of Mn-SOD and catalase in embryos of diabetic rats from a malformation-resistant strain. *Diabetes*. 2000;49: 101-107.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Tosini G. , Pozdeyev N. , Sakamoto K. , Iuvone PM The circadian clock system in the mammalian retina. *Bioessays* . 2008;30:624-633.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

OzgÃ¼r S. , Sancar A. Purification and properties of human blue-light photoreceptor cryptochrome 2. *Biochemistry* . 2003; 42:2926-2932.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

OzgÃ¼r S. , Sancar A. Analysis of autophosphorylating kinase activities of arabidopsis and human cryptochromes. *Biochemistry*. 2006;45:13369-13374.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Hsu DS , Zhao X. , Zhao S. , et al. Putative human blue-light photoreceptors hCRY1 and hCRY2 are flavoproteins. *Biochemistry*. 1996 ;35:13871-13877.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Thompson CL , Blaner WS , Van Gelder RN , et al. Preservation of light signalling to the suprachiasmatic nucleus in vitamin A deficient

mice. Proc Natl Acad Sci U S A. 2001;98: 11708-11713.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Pardini L. , Kaeffer B. Feeding and circadian clocks. Reprod Nutr Dev. 2006;46:463-480.

[Google Scholar](#) | [Crossref](#) | [Medline](#)

Lin JD , Liu C. , Li S. Integration of energy metabolism and the mammalian clock. Cell Cycle. 2008;7:453-457.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Zhang EE , Liu AC , Hirota T. , et al. A genome-wide RNAi screen for modifiers of the circadian clock in human cells. Cell. 2009; 139:199-210.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Maeda Y. , Mayanagi T. , Amagai A. Folic acid is a potent chemoattractant of free-living amoebae in a new and amazing species of protist, Vahlkampfia sp. Zoolog Sci. 2009;26: 179-186.

[Google Scholar](#)

Olney JW , Fuller TA , de Gubareff T. Kainate-like neurotoxicity of folates. Nature. 1981 ;292:165-167.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Robins AH Biological Perspectives on Human Pigmentation. Cambridge, UK: Cambridge University Press; 1991.

[Google Scholar](#) | [Crossref](#)

Wright AJ , Dainty JR , Finglas PM Folic acid metabolism in human subjects revisited: potential implications for proposed mandatory folic acid fortification in the UK. Br J Nutr. 2007; 98:667-675.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Offer T. , Ames BN , Bailey SW , Sabens EA , Nozawa M. , Ayling JE 5-Methyltetrahydrofolate inhibits photosensitization reactions and strand breaks in DNA. FASEB J. 2007;21: 2101-2107.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Shi W. , Meininger CJ , Haynes TE , Hatakeyama K. , Wu G. Regulation of tetrahydrobiopterin synthesis and bioavailability in endothelial cells. Cell Biochem Biophys. 2004

;41:415-434.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Chaplin G. , Jablonski NG. Vitamin D and the evolution of human depigmentation . Am J Phys Anthropol. 2009;139: 451-461.

[Google Scholar](#) | [Crossref](#) | [Medline](#) | [ISI](#)

Lamason RL , Mohideen MA , Mest JR , et al. SLC24A5, a putative cation exchanger, affects pigmentation in zebrafish and humans. Science. 2005;310:1754-1755.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

Gibbons A. European skin turned pale only recently, gene suggests. Science. 2007;316:364.

[Google Scholar](#) | [Crossref](#) | [ISI](#)

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$('.logOut').attr("href", "/action/doLogout?redirectUri="+href);
```

```
let $user=$('#portalLoginBar .my-profile-col.id-person-activated'); if ($user && $user.attr('name') &&
$user.attr('name').length>0) $("+"$user.attr('name')").appendTo('#denial-welcome
span.individualUser');
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document.getElementById("denial-2-cn").style.display = "block";
document.getElementById("denial-2").style.display = "none";
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if($('span.institutionBannerText').length==0) { if($('img#accessLogo').length==0) { $('#denial-institution').hide(); } else { var altText = $('.welcome span.institutionBannerLogo img').attr("alt"); var hrefText = $('.welcome span.institutionBannerLogo a').attr("href"); console.log(altText+' - '+hrefText); if(!altText || altText.length==0) $('.welcome span.institutionBannerLogo').clone().prependTo('#denial-institution div.error:first'); else { if(!hrefText || hrefText.length==0) $('#denial-institution div.error:first').prepend("+altText+"); else $('#denial-institution div.error:first').prepend(" +altText+"); } } }
```

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$('.addOffer input[name="backUri"]').val(window.location.pathname); $(document).ready(function() {  
var ppvOffers=0; var articleTitle="Folic Acid: Beyond Metabolism"; $('.ecommDenial  
#ecommerceForm>div').each(function(){ try{ let  
offerText=$(this).find('b')[0].text().trim().toLowerCase(); let  
offerId=$(this).find('input[name="offerId"]')[0].val(); let offerValue=" for "; if (offerText.lengthShow details
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Here we keep the JS functions that use context sensitive parameters, since these are not working outside HTML assets (e.g. in js files) function removeTlaFromTaxonomyFacet() { //SAGE-2005
"li.ConceptID.parentFacets").each(function(){ let \$link = \$(this).find(".facet-link-container a"); if
link.length) { if (\$link[0].innerHTML.toLowerCase().trim() === "chp".toLowerCase()) { \$(this).css("display",
"none"); // hide this //console.log("Removed TLA code from taxonomy filter"); if
(this).parents(".hiddenChildrenFacets").length) { // If TLA code found in hidden facets, change the More(n)
text to More(n-1) \$(this).parents("div.facetContainer").find("div.toggleMoreFacets a.facet-
link").each(function(){ if (this.innerHTML.toLowerCase().indexOf("more ()") !== -1) { let moreNumber =
this.innerHTML.match(/\d+/)[0]; if (moreNumber > 1) \$(this).text().replace(moreNumber,
moreNumber - 1)); else // if only one was hidden, no need to expand \$(this).parent().css("display", "none"); }
} } }); } function cpTitlesDates() { if ('cpv'==='cp' || 'cpv'==='cpv') { \$('.pubDate-left').addClass('not-show-
important'); } } function deniedPdfAccess() { if (\$('#accessOptionsTop').length > 0) { // clicked on page with
access denial bar toggleDenialBar(); \$('#accessOptionsTop input#login').focus(); } else { // no access denial
bar window.location = '/doi/pdf/10.1177/1533210110392950'; } } function accesibilityImageAltText() {
\$('.moreFromThisJournalModules img').each(function(){ if (\$(this).attr('alt')===undefined) \$(this).attr('alt', '');
\$('.portalResourcesContainer img, .tellUsImage img').attr('alt', '');
.relatedJournalsTextContainer').each(function(){ let \$journalText = \$(this);
\$journalText.closest('.relatedJournalsColumn>a').append(\$journalText.text()); \$journalText.remove();});
.relatedJournalsImageContainer img').each(function(){ let \$coverImage = \$(this); let \$parent =
this).parent(); \$coverImage.addClass('relatedJournalsImageContainer');
\$coverImage.prependTo(\$coverImage.closest('.relatedJournalsColumn>a')); \$parent.remove();});
\$('#td.savedSearch.savedResult:nth-child(4) img').attr('alt', function() { return \$(this).attr('alt').replace('alert
type', 'saved date'); }); \$('#td.savedSearch.savedResult:nth-child(5) img').attr('alt', function() { return
this).attr('alt').replace('alert type', 'last run date'); }) } // run these before document finished loading //
SAGE-1878 //if (\$.more-than').offset().left 0) \$('.pb-ui .accessOptionsBar').css('display', 'block'); else \$('.pb-
.accessOptionsBar').hide(); if (\$('#span.related-Article-wrapper span').length==0) \$('#span.related-Article-
wrapper').hide(); cpTitlesDates(); // Add data module attributes in related journals HTML widget
".otherSociety").attr("data-module-name", "related-journals"); \$(".otherSocietyButton
#viewMoreText").attr("data-item-name", "view-more"); \$(".otherSocietyButton #viewLessText").attr("data-item-
name", "view-fewer"); \$(".otherSocietyButton #viewFewerText").attr("data-item-name", "view-fewer"); // Add a
separator before issue //\$('.mostReadCited .contentItemIssue').text(function () { // if (\$(this).text().trim().length
0 && \$(this).text().trim().indexOf('-')!=0) // return '- +'\$(this).text(); //}); //Move related articles indication into
proper place: \$('#span.related-Article-wrapper').insertAfter('div.articleInformation'); \$('.related-article-
e').text(function() { return \$(this).text().replace(/\s*: /, ': '); }); \$('.online-pub-date').text(function() { return
this).text().replace(/-/g, ' '); }); \$('.contentItemVol').text(function() { return \$(this).text().replace('Vol 0,',
replace('Vol.', 'Vol').replace(/\s*./, ',')); }); \$('.issueFormat').text(function() { return
this).text().replace('issue', 'Issue').replace('vol.', 'Vol').replace(/\s*./, ',')); //Remove trailing dot from
deleteAccountLink \$('a.deleteAccountLink').text('Delete your account'); //Remove trailing dot from
deleteAccountLink \$('a#copyToClipboard').text('Copy to Clipboard'); // Rename "Views" to "Views and
Downloads" \$('.view-count').text(function() { if (inJournalScope()) return \$(this).text().replace('Views:', 'Views

```
downloads:'); else return $(this).text();}); // Keep only anchor element if already in citedBy page if($('.view-citedBy a').attr('href') === window.location.pathname) $('.view-all-citedBy a').attr('href', ""); // Add #top-content-scroll on 'View All' citedBy link $('.view-all-citedBy a').attr('href', $('.view-all-citedBy a').attr('href') + '#op-content-scroll'); // Change MR/MC panel text $('#mostReadCitedPage .online-pub-date').text(function() return $(this).text().replace("Online publication date", "First published")); //Wait for images to load, before deciding whether to move the related journals $('.journalHomeFourRight').imagesLoaded().always(function(){ moveRelatedJournals(); //console.log('Ad(right) image is loaded');}); // Fix for 'more...' label falling into 2nd row if($('.authors .more-than').length && $('.authors .more-than').offset().left > 0) $('input[name=AllField]').autocomplete('close'); } catch(e) {}}); //console.log('Journal: Journal of Evidence-based Integrative Medicine, Issue: , Article: Folic Acid: Beyond Metabolism');
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