Mucegaiurile de interior
un pericol pentru sanatate

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de Luke Curtis, MS, CIH; Allan Lieberman, MD; Martha Stark, MD; William Rea; Marsha Vetter, MD, PhD

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Mucegaiurile si micotoxinele produse de catre acestea constituie o amenintare tot mai mare la adresa sanatatii, fiind necesara adoptarea pe scara larga a unor teste pentru detectarea si diagnosticarea lor.

Introducere

In ultimii ani, atentia publicului s-a concentrat tot mai mult asupra problemei reprezentate de mucegaiuri, prezente atat in interiorul caselor cat si al locurilor de munca si asupra pericolelor pe care o prezinta expunerea la acestea. Aceasta lucrare este prezentata de Academia Americana de Medicina a Mediului (American Academy of Environmental Medicine (AAEM)) si prezinta cunostintele pe care le avem in prezent in privinta efectelor adverse ale mucegaiului de interior.

Exista numeroase dovezi in literatura medicala care confirma efectele negative pe care le are aerul contaminat cu mucegai asupra sanatatii oamenilor. Expunerea la aerul contaminat cu mucegai de interior cauzeaza frecvent efecte adverse asupra sanatatii umane provocand leziuni si disfunctii ale multor organe si sisteme incluzand: 1) sistemul respirator, 2) sistemul nervos, 3) sistemul imunitar, 4) sistemul hematologic si 5) piele. Mucegaiul de interior este, de asemenea, o cauza comuna pentru infectiile sistemice ce pun in pericol viata pacientilor cu un sistem imunitar compromis.

Mucegaiurile sunt omniprezente in mediul interior

Ciupercile (sau mucegaiurile) sunt omniprezente atat in mediul interior cat si in cel exterior. Mucegaiurile sunt frecvent raspandite pe calea aerului, prin spori. Pentru a putea creste, mucegaiul si sporii de mucegai au nevoie de umezeala si de o sursa de hrana precum celuloza sau mancarea aflata in descompunere.

1. Din moment ce sporii de mucegai se umfla si cresc in prezenta apei, ei se alungesc, formand niste protuberante de forma unor baloane (hife) care secreta micotoxine si enzime digestive. Ciuperca digereaza apoi sursa de hrana pentru a-si sustine cresterea. Aproximativ 100000 de specii de ciuperci au fost deja identificate; de fapt, se estimeaza ca ciupercile reprezinta un uimitor procent de 25% din biomasa globala.

2. Cercetari variate realizate in casele din America de Nord si Europa au raportat ca mucegaiul vizibil si/sau pagubele datorate apei au fost descoperite in 23% pana la 98% din totalul caselor studiate.

3-6 In prezent nu exista standarde oficiale pentru concentratia de ciuperci de interior care se propaga pe calea aerului. Totusi, un nivel al ciupercilor de interior de peste 150 pana la 1.000 de unitati formatoare de colonii pe metru cub de aer (cfu/m3) este considerat a fi suficient pentru a cauza probleme de sanatate.[4, 7-9] Numeroase rapoarte au demonstrat ca aerul din interior poate fi adeseori contaminat cu niveluri de spori de mucegai mult peste 1000 cfu/m3. Cele mai comune ciuperci de interior sunt Cladosporium, Aspergillus si Penicillium. Speciile de Alternaria, Stachybotrys, Rhizopus, Mucor, Wallemia, Trichoderma, drojdii, Botrytis, Epicoccum si Fusarium sunt deseori descoperite si in interior.[10-17]

Prescrierile de ipoteci, procesele si cererile de asigurari datorate problemelor cauzate de mucegai sunt obisnuite.

In America se primesc aproximativ 50 de telefoane pe saptamana de la asigurati a caror ipoteca a casei urmeaza sa fie prescrisa din cauza problemelor cu mucegaiul.[18] In 2002, in tribunalele din SUA se aflau pe rol aproximativ 10.000 de cazuri legate de mucegai[19], industria asigurarilor platind in Texas peste 2 miliarde de dolari numai in cazurile legate de acestea.[20]

Simptome datorate mucegaiului

Multi pacienti au raportat aparitia a o multime de efecte negative asupra sanatatii datorita expunerilor la mucegai. Studii efectuate asupra a mai mult de 1.600 de pacienti care sufereau datorita expunerii la fungii au fost prezentate la o intalnire in Dallas din 2003 (21st Annual Symposium of Man and His Environment, Dallas, Texas, iunie 2003 [19-22]).[21-25]

Pentru a cita cateva studii... Lieberman[21] a examinat 48 de pacienti expusi la mucegai care aveau urmatoarele probleme de sanatate: 1) dureri musculare si/sau de articulatii, 71%; 2) oboseala/slabiciune, 70%; 3) disfunctii neurocognitive, 67%; 4) sinuzite, 65%; 5) dureri de cap, 65%; 6) probleme gastrointestinale, 58%; 7) probleme de respiratie 54%; 8) anxietate/depresie/ iritabilitate, 54%; 9) probleme de vedere 42%; 10) senzatii de apasare in piept, 42%; 11) insomnie, 40%; 12) ameteala, 38%; 13) amorteala/furnicaturi, 35%; 14) laringita, 35%; 15) greata, 33%; 16) eruptii pe piele, 27%; 17) tremuraturi, 25%; si 18) palpitatii ale inimii, 21%. Studiul lui Rea asupra a 150 de pacienti expusi la mucegaiul de interior a identificat urmatoarele probleme de sanatate: 1) oboseala, 100%; 2) rinita, 65%; 3) pierderi de memorie si alte probleme neuropsihiatrice, 46%; 4) probleme respiratorii, 40%; 5) fibromialgie, 29%; 6) colita mucoasa, 25%; 7) vasculita, 4.7%; si 8) angioedem, 4.0%. Aceste rapoarte clinice demonstreaza efectele adverse ale mucegaiului raspandit pe calea aerului. Exista in prezent numeroase dovezi in literatura medicala de specialitate, ce arata ca expunerea la ciupercile de interior raspandite pe calea aerului poate cauza numeroase efecte adverse.

Mecanismele de actiune ale mucegaiurilor asupra sanatatii

Ciupercile pot exercita efecte negative asupra sanatatii prin intermediul a trei mecanisme: 1) infectie; 2) alergie si 3) toxicitate. Infectiile grave provocate de ciuperci precum Candida, Aspergillus si Pneumocystis sunt comune si cele mai multe apar la pacientii cu un sistem imunitar sever compromis.[26-28]

Ciupercile precum Candida, Histoplasmosis, Cryptococcus, Blastomyces si Coccidioides pot afecta intern persoanele cu o imunitate optima.[29] Ciupercile precum Trichophyton, Candida si Malasezia cauzeaza de obicei infectii minore ale pielii la oamenii cu un bun sistem imunitar.[28] Cel putin 70 de alergeni au fost pe larg clasificati dupa spori, parti vegetative si particule mici din ciuperci (0,3 microni si mai mici).[30, 31] Alergiile provocate de alergenii din ciuperci sunt foarte comune.

O revizuire a 17 studii a descoperit ca 6% -10% din populatie si 15%-50% dintre cei cu o predispozitie ereditara au prezentat o sensibilitate imediata a pielii la ciuperci.[32]

Ciupercile produc o mare varietate de substante chimice toxice numite micotoxine.[1, 33, 34] Printre micotoxinele comune se includ: 1) aflatoxinele: substante carcinogene foarte puternice si hepatotoxinele produse de unele specii de Aspergillus; 2) ochratoxinele: nefrotoxice si carcinogene; produse de unele specii de Aspergillus si Penicillium; 3) sterigmatocistina: o substanta represiva pentru sistemul imunitar si carcinogena pentru ficat produsa de specii de Aspergillus, in special A.multicolor; si 4) trichothecenele: produse mai ales de specii de Stachybotrys si Fusarium, si despre care s-a raportat ca inhiba sinteza proteinelor si cauzeaza hemoragii si varsaturi.

Ciupercile produc de asemenea beta-glucani care au efecte imunologice.[35] Mirosul mucegaiurilor provine in special de la compusii organici volatili.[36] Efectele adverse asupra oamenilor si animalelor cauzate de alimentele contaminate cu micotoxina au fost recunoscute inca de la inceputul secolului al XX-lea.[33, 37] Dar daca micotoxina ne afecteaza doar atunci cand este inhalata, aceasta este o intrebare al carei raspuns este inca dezbatut.[38] In absenta unor studii controlate, efectuate asupra unor subiecti umani expusi inhalarii de micotoxina, numai cercetarile privind expunerea controlata de animale si cele de epidemiologie umana pot fi folosite. Studiile demonstreaza ca semnificative cantitati de micotoxine (inclusiv ochratoxina, sterigmatocistina si trichothecenele) si spori de ciuperci care pot fi absorbiti pe calea aerului.[34, 37, 44, 45] sunt prezente in praful de interior[39-43].

Pacientii expusi la Stachybotrys de interior au prezentat niveluri masurabile ale toxinei hemoragice de stacilisin.[46]

Nivelurile de micotoxine trichothecene din urina au fost semnificativ mai mari la pacientii expusi la niveluri mari de ciuperci de interior, in contrast cu un grup de control care nu fusese expus la niveluri ridicate de ciuperci de interior.[47]

Nivelurile de ochratoxina din sange au fost gasite in mod semnificativ mai ridicate la muncitorii din industria alimentara expusi la ochratoxina raspandita pe calea aerului fata de cei neexpusi.[43]

Aceste descoperiri demonstreaza in mod clar ca inhalarea este modul de intrare in organism a microtoxinelor.

Prelevarea probelor in cazul expunerii la mucegaiuri

Prelevarea probelor in cazul ciupercii de interior este cel mai adesea facuta prin masurarea nivelurilor de spori viabili (ce pot fi cultivati) sau totali (viabili si ne-viabili) din aer.[48, 49] Unele metode de luare de probe viabile din aer, precum esantionarile Andersen, colecteaza aer doar pentru cateva minute.

Metoda prin care particulelor li se permite sa se aseze pe un anumit suport este una

putin costisitoare si permite obtinerea unei masuri semi-cantitative a nivelurilor de ciuperca de interior raspandita pe calea aerului. Masuratorile de spori viabili si neviabili din aer pot varia considerabil in decursul unei perioade scurte de timp, astfel ca prelevarea de probe din aer pe parcursul catorva perioade de timp poate fi necesara pentru a caracteriza precis nivelurile de spori de ciuperca din aer.[48, 49]

Totusi, masuratorile de ciuperca din aer nu iau in considerare contaminarea cu mucegaiul care nu este prezent in aer, precum contaminarea cu mucegai din praf sau de pe suprafete (uneori vizibile cu ochiul liber) si cu micotoxinele din aer, praf si de pe suprafete.[48, 50] Astfel, testarea prafului depus pentru a vedea nivelul de ciuperci si micotoxine este deseori recomandata.[48, 49]

Pentru a se asigura o evaluare mai completa, se recomanda adeseori ca masuratorile din aer sa fie suplimentate de testarea mucegaiurilor si micotoxinelor din praful deja depus sau din aer.[48, 49] Alte tehnici precum PCR (reactia in lant a polimerazei), ELISA (incercarea de legare a unui anticorp de o enzima) si masurarea substantelor chimice organice volatile produse de ciuperci, polizaharide, ergosterol si beta-glucani poate de asemenea sa fie folositoare pentru a testa mediile interioare de mucegaiuri si de alergeni si micotoxinele lor.[48] Pentru o privire de ansamblu in legatura cu metodele de luare de probe, va rugam sa consultati Pasanen[48] si Macher.[51] Pentru un ghid informativ privind clasificarea, identificarea si biologia ciupercilor comune de interior, vezi Samson.1 Exista cateva ghiduri bune pentru prevenirea si remedierea problemelor cauzate ciuperci de interior.[51-53]

Expunerea la mucegaiul de interior si problemele respiratorii

Multe studii epidemiologice au mentionat ca expunerea la domiciliu la mucegaiuri si/sau umezeala cronica poate creste incidenta si morbiditatea asociate astmului/respiratiei dificile atat la copii cat si la adulti.[4-6, 54-67] Astmul si starile legate de acesta sunt foarte comune in SUA, cu o incidenta totala de aproximativ 5,4% la toate grupele de varsta si incidente de pana la 27% la copiii din orase.[68]

Studiile pe copii cu o varsta de pana la sapte ani au aratat ca expunerile de durata la ciuperci au fost asociate cu o prezenta mai ridicata a respiratiei dificile, a tusei si a bolilor aparatului respirator.[69, 70]

Nivelurile mai ridicate ale beta-glucanului de interior au fost asociate cu niveluri semnificativ mai ridicate de senzatii de strangere a pieptului si de dureri la nivelul articulatiilor.[71] S-a raportat ca expunerea profesionala la mucegai a fost asociata cu niveluri semnificativ mai ridicate de astm, sinuzita, piele si ochi iritati, si oboseala cronica.[72-76]

Un studiu a descoperit ca pacientii expusi la niveluri ridicate de ciuperci de interior aveau o functie a plamanilor semnificativ mai scazuta decat cei neexpusi.[24]

Concentratiile mai ridicate de ciuperci din mediul exterior au fost considerate ca avand legatura cu ratele mai ridicate de mortalitate datorate astmului[77] si cu incidenta crescuta a astmului[78, 79] la copii si la tineri.

Expunerile in scop experimental la extracte de Penicillium si Alternaria echivalente unor niveluri ridicate de expunere la ciuperci exterioare au fost mentionate ca reducand functia pulmonara foarte mult la astmatici.[80] Sensibilitatea pielii la Alternaria a fost legata de un risc mai ridicat de oprire a respiratiei.[81] Variate studii

epidemiologice au asociat sensibilitatea pielii la ciupercile de interior si incidenta sau severitatea mai mare a astmului[82-86] si ratele mai ridicate de sinuzita.[87]

Expunerea la ciupercile raspandite prin aer poate cauza sinuzita, aspergiloza bronhopulmonara si hipersensibilitate la pneumonita.88-89 Aproximativ 14% din populatia SUA sufera de rinosinuzita si de diverse conditii inrudite cu aceasta.[90]

Sinuzita alergica fungala a fost diagnosticata pe baza cresterilor concentratiei de ciuperci din secretiile nazale si dupa prezenta mucinului alergic la 93% din 101 pacienti ce urmau sa faca o operatie la nivelul sinusurilor.[90] In cadrul unui alt studiu s-a reusit recuperarea unor ciuperci (si cultivarea lor ulterioara) din sinusurile a 56% dintre 45 de pacienti care urmau sa faca o operatie endoscopica a sinusurilor pentru rhinosinuzita cronica.[91]

Un studiu indelungat efectuat asupra a 639 de pacientii cu sinuzita alergica fungala a demonstrat ca pasii facuti pentru a reduce expunerea la ciuperci (prin utilizarea de exemplu a filtrelor de aer, a ionizatoarelor, sistemelor de control ale umiditatii si a spray-urilor antimicrobiale nazale) au redus rinosinuzita semnificativ si au imbunatatit morfologia mucoasei nazale. Acest studiu a concluzionat ca neputinta de a reduce nivelurile de ciuperci din aer la mai putin de patru pe ora pe placuta de depunere inseamna nerezolvarea sinuzitei.[22] Desi, din punct de vedere istoric, medicamentele fungicide nu au fost in general recomandate pentru tratamentul sinuzitei fungale,88-89 studii recente au descoperit efectele benefice ale medicatiei orale si nazale asupra pacientilor cu sinuzita.[22, 92] Cateva studii au facut legatura dintre expunerea rezidentiala la ciuperci cu hipersensibilitatea la pneumonita.[93-95]

Stachybotrys si efectele hemoragice

Expunerea la niveluri ridicate de Stachybotrys, Aspergillus si alte ciuperci de interior a fost epidemiologic asociata cu hemoragia la nivelul plamanilor la copiii sub sapte ani.[96-100] Desi s-au ridicat diverse intrebari asupra modului in care a fost descoperita aceasta asociere,[101] ea indeplineste multe criterii epidemiologice pentru cauzalitate.[102]

Hemoragia pulmonara acuta la copiii sub sapte ani poate deveni rapid fatala; cand copilul supravietuieste, apar leziuni ale vaselor de sange din plamani si depozite de hemosiderina vor ramane in macrofagele plamanului, putand fi ulterior observate in tesutul obtinut in urma bronhoscopiei.[97]

Ciupercile Stachybotrys produc o gama larga de trichothecene, micotoxine (inclusiv satratoxine), cativa epimeri roridini, verucarina J si B si hemolizina.[34, 99] O proteina hemoragica numita stacilisina a fost izolata din Stachybotrys colectat din casele copiilor cu hemoragie pulmonara[103, 104] si din serul pacientilor expusi la Stachybotrys.[46] S-a emis ipoteza ca copiii mici, cu plamanii aflati in crestere sunt mai susceptibili la efectele toxice ale micotoxinelor de Stachybotrys.[105]

Studiile efectuate asupra unor adulti expusi la Stachybotrys au mentionat o incidenta mai mare a unor probleme de sanatate precum: afectiuni ale cailor respiratorii, respiratie dificila, iritarea pielii si a ochilor, simptome asemanatoare gripei si oboseala cronica.[106] Stachybotrys a mai fost izolat si din plamanii unui copil cu hemosideroza pulmonara.[107]

Schimbari imunologice

Expunerea la fungi poate altera parametrii imunologici. Unele studii au raportat ca pacientii expusi la ciupercile de interior au niveluri mai ridicate in ser, de anticorpi IgG, IgA si IgM la ciupercile comune, trichothecene si satratoxine.[108-110]

Intr-o scoala infectata cu mucegai, la subiectii ce sufereau de sinuzita anticorpii IgG la noua specii comune de ciuperci de interior erau semnificativ mai ridicati decat la subiectii sanatosi.[111] Alte studii nu au evidentiat nici o crestere semnificativa a IgG fungal[112,113] sau IgE fungal[108] la pacientii expusi la ciuperci. Expunerea la ciupercile de interior a fost asociata cu niveluri modificate de celule T4, T8 si NK si cu niveluri mai ridicate de auto-anticorpi.[23, 114, 115]

Expunerea la glucanul din interior a fost asociata cu o proportie mai mica de celule T citoxice (CD8+SF61+) si cu un factor de secretie de necroza tumorala mai ridicat decat in casele cu niveluri mai scazute de beta-glucani.[116] Studiile pe animale carora li s-au administrat pe cale orala astfel de micotoxine comune precum aflatoxine, ochratoxine si trichothecene arata o considerabila deteriorare a sistemului imunitar, inclusiv scaderea imunitatii celulelor T, B si a macrofagelor.[117]

Studii ale liniilor de celule (cultura de celule care prolifereaza la infinit daca traieste intr-un mediu proaspat si intr-un spatiu potrivit, n.ed.) au descoperit ca multe micotoxine pot suprima celulele T, B si activitatea NK la concentratii ale serului similare cu cele descoperite la pacientii expusi la mucegaiul de interior.[118]

Prin urmare, expunerea la micotoxinele ce se raspandesc pe calea aerului este considerata a cauza efecte daunatoare asupra sistemului imunitar.

Disfunctii neurologice

Expunerea la mucegaiul de interior raspandit pe calea aerului cauzeaza disfunctii neurologice si deficiente cognitive.

Rapoarte clinice privitoare la un numar mare de pacienti expusi la mucegai au descoperit simptome de oboseala si slabiciune la 70%-100% din cazuri si disfunctii neurocognitive inclusiv pierderi de memorie, iritabilitate, anxietate si depresie la peste 40% dintre pacienti. De asemenea s-au constat la un numar semnificativ de pacientii amorteli, furnicaturi si tremuraturi.[21, 23] Aceste semne si simptome constituie manifestari clasice de neurotoxicitate.[119]

Un studiu efectuat asupra a 43 de pacienti expusi la mucegai a descoperit ca acestia aveau rezultate semnificativ mai slabe (in raport cu 202 valori normale, de control) la multe teste neuropsihiatrice ce includeau echilibrul, reflexul de clipire, perceptia culorilor, timpii de reactie si puterea de strangere cu mana stanga ($P<0,0001$ in fiecare caz).[120]

Studii cantitative ale unor electro-encefalograme au mentionat de asemenea latente semnificativ mai mari la pacientii expusi la ciuperci.[120] O imagine scanata a creierului SPECT a relevat pattern-uri neurotoxice la 26 din 30 (87%) dintre pacientii expusi la mucegai.[121] Un studiu al functiei nervoase vegetative la 60 de pacienti expusi la mucegai a descoperit ca 95% aveau raspunsuri vegetative anormale ale pupilei.[23] Studiile privind sensibilitatea vizuala de contrast erau de asemenea anormale la pacienti expusi la mucegaiul de interior.[23]

Studii aditionale au raportat ca pacientii expusi la mucegai au rezultate semnificativ mai slabe la testele de atentie, echilibru, timp de reactie, memorie verbala, concentrare, memorie si miscare ritmica a degetelor.[24, 122-124]

Majoritatea acestor pacienti prezentau de asemenea o gama larga de probleme de sanatate, inclusiv oboseala cronica, dureri de cap, insomnie, concentrare si atentie scazute. Studiile a 10 copii expusi la mucegai de interior si a 378 de adulti expusi la mucegai de interior au descoperit semnificativ mai multe anormalitati neurofiziologice; acestea includeau EEG-uri anormale si potentiale vizuale si somatosenzoriale anormale.[25, 125]

Numarul mare de constatari neuropsihologice obiective, efectuate asupra unor pacientii simptomaticii, sustin ideea ca expunerea la mucegaiurile de interior poate avea efecte adverse asupra sanatatii.

Disfunctii renale

Expunerea la ciuperci poate de asemenea cauza disfunctii la nivelul rinichilor. Este bine cunoscut faptul ca alimentele contaminate cu ochratoxina sunt nefrotoxice.[126, 127] Expunerea la ochratoxina de interior poate fi si ea nefrotoxica.

Exista de asemenea un studiu efectuat asupra unei familii care prezenta simptome de sete crescuta, tendinte de urinare frecventa, letargie si eruptii pe piele. Cantitati considerabile de ochratoxina au fost descoperite in praful din casa in care locuia aceasta familie. Membrii familiei si-a revenit imediat dupa ce s-au mutat intr-o alta casa.[38]

Infectii fungale potential fatale

In ultimii ani, a crescut incidenta infectiilor ce ameninta viata la pacientii cu un sistem imunitar compromis din cauza lui Aspergillus si a altor ciuperci comune.[128, 129] Aspergiloza invaziva este foarte comuna la pacientii cu un sistem imunitar compromis, cel mai des fiind intalnita in urmatoarele cazuri: transplanturi de plaman, 17%-26%; transplanturi alogene de maduva osoasa, 5%-15%; leucemie acuta, 5%-24%; si transplanturi de inima, 2%-13%.[130, 131] Chiar si atunci cand sunt utilizate medicamente fungicide puternice si sunt efectuate tratamente intense intraspitalicesti, ratele de mortalitate datorita aspergiliozei invazive sunt intre 50% si 99% in cazul celor cu un sistem imunitar compromis.[132, 133] Controlul mediului inconjurator joaca un rol cheie in prevenirea infectiilor cu Aspergillus. Cateva studii au asociat lucrarile de amenajare ale spitalelor cu o rata crescuta a cazurilor de aspergiloza invaziva.[134-137] S-a demonstrat ca incercarile de control al mediului inconjurator, precum folosirea filtrelor HEPA, sigilarea incaperilor, curatarea camerelor in mod regulat si folosirea de vopsea fungicida cu quinolat de cupru 8 reduc semnificativ nivelurile de Aspergillus din aer si ratele de aspergiloza invaziva la pacientii din spitale cu un sistem imunitar compromis.[135-141] Alta cercetare recenta a aratat faptul ca un numar mare de spori de Aspergillus pot fi transmisi prin rezervele de apa[142] si ca o dezinfectare eficienta a dusurilor poate reduce semnificativ nivelurile de Aspergillus.[143]

Diagnosticarea si tratarea problemelor de sanatate cauzate de mucegaiuri

O examinare atenta a mediului si a istoricului medical este un prim pas esential in evaluarea unui pacient cu probleme de sanatate datorate mucegaiului.[52, 144-146]

O atentie speciala ar trebui acordata oricarei expuneri la orice forma vizibila de mucegai si/sau la pagubele datorate umiditatii, in casa sau la locul de munca. Prelevarea de probe din mediu de spori viabili, spori totali si micotoxine din aer si praf poate furniza informatii importante despre expunere.

Pentru pacientii suspectati de a fi fost expusi in mod substantial la ciuperci, o baterie de teste sofisticate de laborator a fost dezvoltata, ce analizeaza: 1) prezenta in serul acestor pacienti a unor anticorpi la mucegaiuri si micotoxine;[108, 109] 2) factori imunologici;[115] 3) micotoxine in urina si sange;[47] si 4) cativa parametrii importanti (inclusiv electrolitii, zaharul din sange si starea rinichilor) folosind un panou metabolic de baza. De asemenea, toti pacientii expusi la mucegaiuri ar trebui sa fie supusi unor teste de sensibilitate la contrastul vizual. Folosirea unei baterii de teste neuropsihologice standard[23, 122-124] precum si testarea nervilor vegetativi, electroencefalograma si tehnicile de vizualizarea a creierului precum SPECT si MRI pot fi instrumente foarte folositoare in documentarea leziunilor neurologice datorate mucegaiului.[25, 120, 121, 125, 144] Testarea functiei pulmonare este si ea utila pentru pacientii cu simptome respiratorii.[24, 120] Daca simptomele pacientului si/sau o examinare sugereaza afectarea urechilor, nasului, gatului, sistemului gastrointestinal, ochilor sau inimii, atunci consultarea unor medici specializati in expunerile din mediu inconjurator (fie un specialist in otorinolaringologie, un gastroenterolog, un oftalmolog sau un cardiolog) poate fi de mare folos. Ne-efectuarea unor testari obiective care sa permita evaluarea disfunctiei unui sistem sau a unui organ explica pozitia acceptata in prezent, ca expunerile la mucegaiul raspandit pe calea aerului nu au efecte adverse semnificative pentru sanatate.[38]

Factori comuni, non-fungali, ai mediului interior includ slaba ventilatie, monoxidul de carbon provenit de la surse de caldura defecte, pesticidele, fumatul pasiv, substantele petrochimice precum acelea ce se gasesc in produsele de curatat, materialele de constructie si solventii, formaldehida din materialele de constructie, bacteriile si alergenii din blanuri, penele si saliva unor animale care traiesc in casa precum gandacii de bucatarie, acarienii din praf, pisicile, cainii, pasarile din colivii si porumbeii. Expunerea la ozon, fumatul pasiv, formaldehida, alergenii proveniti de la gandacii de bucatarie si infectiile virale pot de asemenea avea un efect sinergic cu expunerea la ciuperci, contribuind la inrautatirea astmului si rinitei.[147-151] Cea mai importanta parte a tratamentului pentru pacientii expusi la mucegai consta in evitarea expunerii la ciuperci si eliminarea contaminarii cu mucegai acasa si la locul de munca. Orice scurgeri de apa si zonele inundate sau umede trebuie imediat corectate. Suprafetele neporoase precum podelele si peretii, ce prezinta cresteri vizibile de mucegai trebuie curatate. Materialele poroase, pline de apa precum covoarele si mobila trebuie aruncate.

Controlul umiditatii este important pentru a se controla cresterile de mucegai. Folosirea aparatelor de aer conditionat si a dezumidificatoarelor poate reduce semnificativ in timpul verii concentratiile de mucegai de interior raspandit pe calea aerului.[10, 152] Filtrele de aer HEPA pot de asemenea reduce semnificativ concentratiile de ciuperca de interior raspandita pe calea aerului.[141] Pentru eliminarea problemelor severe cauzate de apa si mucegaiul de interior, folosirea unui echipament de protectie precum masti de fata si/sau interventia unei firme de curatare profesionista poate fi esentiala.[50-52] Folosirea unor metode de

imunoterapie (pe cale sublinguala sau injectabila) contra ciupercilor s-a dovedit a fi benefica pentru unii pacienti sensibili la mucegaiurile comune de interior precum Alternaria si Cladosporium herbarium.[153, 154]

Alte terapii ce s-a descoperit ca sunt eficiente sunt: 1) detoxifierea (sauna, masajul, exercitiile fizice); 2) corectarea deficientelor imunitare ce au fost identificate; 3) folosirea de medicamente topice, nazale sau orale fungicide atunci cand se indica acest lucru. Unele studii efectuate pe animale de laborator sugereaza ca o dieta de calitate cu vitamine antioxidante adecvate, seleniu, substante fitochimice, metionina si proteine pot reduce efectele daunatoare ale micotoxinelor din alimente. [155, 156]

Rezumat

Mucegaiul de interior raspandit pe calea aerului si/sau expunerile la micotoxine cauzeaza o gama larga de efecte adverse asupra sanatatii, asa cum se indica in cele peste 100 de referinte citate. Profesionistii din sanatate, managerii din constructii, proprietarii de case si publicul trebuie sa fie mult mai constienti de efectele adverse ale mucegaiurilor si micotoxinelor asupra sanatatii, de nevoia de reparare corecta a cladirilor si de necesitatea stabilirii unor diagnostice si tratamente corecte. Exista suficiente date in literatura medicala si un numar mare de rapoarte clinice, pentru a demonstra efectele adverse pe care le are mucegaiul de interior raspandit pe calea aerului, asupra sanatatii. Expunerea la mucegaiul de interior si micotoxine absorbite pe cale respiratorie poate fi o cale majora de lezare a sanatatii prin toate cele trei mecanisme cunoscute: infectie, alergie si toxicitate.

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Despre autori:

Luke Curtis, Master in Stiinta, CIH, Scoala de Sanatate Publica, Universitatea din Illinois, Chicago, Illinois, SUA;

Allan Lieberman, Medic, Centrul pentru Sanatate Profesionala si de Mediu, North Charleston, Carolina de Sud, SUA;

Martha Stark, Medic, Universitatea Harvard, Newton Center, Massachusetts, SUA;

William Rea, Centrul de Sanatate a Mediului, Dallas, Texas, SUA;

Marsha Vetter, Medic, Dr., Centrul de Sanatate a Mediului, Hoffman Estates, Illinois, SUA.