

# 硫磺泉之生理與醫療效應

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硫磺泉水中的主要成分包括硫化氫、鹼金屬硫化氫物(hydrosulfides of alkali metals)及其他含硫之有機與無機化合物。硫磺泉與空氣接觸一段時間後，泉水中二價硫會被氧化成四價及六價硫，因而降低其“還原”作用與浴療的效果，而此硫磺泉隨著時間流逝的“氧化”過程可視之為溫泉的“老化”作用。

硫磺泉浴的主要作用是經由硫的穿透皮膚達到身體的各個組織內，硫光是在皮膚的蓄積量便達60 mg/100 g(皮膚組織);泉水中的硫可以在皮膚表皮的深層處與氧的自由基交互作用而產生連五硫酸(H<sub>2</sub>S<sub>5</sub>O<sub>6</sub>)，而連五硫酸應是硫磺泉水抗細菌及抗黴菌活性的有效成分。

硫磺泉浴的生物活性包括了增強蛋白質的代謝以增加肌酸酐的排泄、增加醣類的代謝與胰島素的分泌來降低血糖濃度、改變嘌呤的代謝以降低血中尿酸的濃度與增進尿液尿酸的排泄、降低血液中膽固醇的濃度、抗血小板與抗動脈粥狀硬化之活性、減緩關節的疼痛、加強澱粉酶(diastase)與胰蛋白酶(trypsin)的消化力及抑制抗透明質酸酶(anti-hyaluronidase)與膽鹼酯酶(choline esterase)之作用、增加血液補體與免疫球蛋白之活性、參與抗原-抗體的反應、抗風濕與抗甲狀腺效果(Antirheumatic and antithyroid effects)及增強有機與無機物毒物(organic and mineral poisons)的解毒力。

低分子量的硫化合物在催化(catalysis)及解毒(detoxification)方面扮演著重要的角色，其中選擇性羥硫酸化(Selective hydroxyl sulfation)的硫酸脂(sulfate esters)便具有裂解酚類化合物(phenols)及解毒的功能，就如同磺基轉移酶(sulfotransferase enzyme)之代謝水楊酸(salicylates)。基於硫醇化合物(thiol)之抗彈性蛋白酶活性及抑制呼吸道發炎作用，硫磺泉蒸氣的吸入療法是有利於慢性阻塞性肺病病況的改善。

硫磺泉可增加血液中穀胱甘肽(glutathione)的濃度及抗氧化力，身體中無所不在的穀胱甘肽及半胱胺酸(cysteine)除了可以調節氧化還原之平衡反應外還可以成為防止重金屬與其他毒性化合物中毒的保護者，而硫便是位在穀胱甘肽及半胱胺酸二分子的核心中心位置上;於此，因為半胱胺酸所提供的硫助予穀胱甘肽的合成，才讓這體內最主要的抗氧化劑擁有驚人清除自由基之硫氫基(sulfhydryl)的能力。

浴療硫磺泉之濃度大致上分為高濃度(>100 mg H<sub>2</sub>S/L)、中濃度(50-100 mg H<sub>2</sub>S/L)及低濃度(<50 mg H<sub>2</sub>S/L)。一般而言，高濃度的硫磺泉有角質溶解(keratolytic effect)之效果可讓皮膚的上皮組織軟化與角質去除;相反地，低

濃度硫磺泉則會讓皮膚上皮細胞不正常的增生並且回歸於較為正常的生理狀態，其角質溶解(keratoplastic effect)之效也讓新的肌膚更具黏合性與彈性。

硫磺泉除了泉水中之雙硫鍵化合物擁有“還原”的特性外，還具有殺菌與抗寄生蟲(antiparasitic)的功能，就如溫泉中的硫本身就可對抗疥瘡(scabies)的感染並緩解其症狀。此外，硫磺泉自古就被利用做為浴療乾癬之用，像是高濃度硫磺泉被運用於輔助治療皮膚疾病的治療便已經歷了數百年，而接受治療之病患大部分都是罹患乾癬的病人，硫磺泉浴療具有降低病症嚴重性及延長緩解期之成效，而且治療結束時的症狀大多獲致明顯改善；然而，對於病況較嚴重患者的效果則可能是不那麼地令人滿意，所以，在浴療之療程方面則建議要多延長一些時日(多於21天)。

硫磺泉有利於皮膚形成腺苷酸(adenylic acid)與其他類組織胺的化合物以造成血管叢的延伸與擴張-讓組織呈現充血的狀態，如此皮膚的營養狀況得以改善。至於硫磺泉的皮膚病適應症則包括神經性皮炎(neurodermatitis)、慢性蕁麻疹、系統性硬皮症、扁平苔蘚、靜脈曲張症候群、職業性皮膚疾病、脂漏性皮膚炎、尋常性痤瘡、慢性皮膚鏈球菌與葡萄球菌感染、血管性皮膚病變及角化症皮膚炎(keratosis dermatitis)等。在另一方面，因為潛在毒性的硫磺泉也會強化其原發性的皮膚病變並造成次發性皮膚炎，所以，硫磺泉的在浴療上一定要特別的審慎，要在經驗豐富的溫泉醫療專科醫師之醫囑下完成醫療行為。硫磺泉在皮膚浴用方面的禁忌症：痤瘡傾向的膚質、皮膚癌、某些病毒性皮膚病、梅毒、類天庖瘡(pemphigoid)、杜林氏病(Dühring's disease)及圓盤狀狼瘡(discoid lupus erythematosus)。

泡硫磺泉之危險性及效益似乎是遵循著“類激效雙相生物反應曲線”(the hormetic-like biphasic biological response curve)的軌跡，也就是說：此潛在性“小劑量”之毒性物質可以源自預先調節(preconditioning)或是直接作用於生物學或是臨床上形成有利的刺激性反應，而相同之化合物在“大劑量”或是不同的潛在條件(underlying conditions)下則會造成反相的毒性作用，所以，如何將硫磺泉適度地控管在安全又有效的醫療範疇內則是一門藝術。

基本上，硫磺泉的浴療效果並不會因泉質中硫濃度的增加而提升，反之，硫化合物會與皮膚表面汗水中的尿素反應形成具有輕微毒性的硫化銨(ammonium sulfide)，而含高濃度硫之溫泉水則被認為是可以引發皮膚炎的潛在性刺激物(特別是老年人及嬰兒)，所以在浴用上需特別的留意！

#### 參考文獻

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