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EDITORIAL

Eighty Years of *Mycopathologia*: A Retrospective Analysis of Progress Made in Understanding Human and Animal Fungal Pathogens

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Abstract *Mycopathologia* was founded in 1938 to 'diffuse the understanding of fungal diseases in man and animals among mycologists.' This was an important mission considering that pathogenic fungi for humans and animals represent a tiny minority of the estimated 1.5–5 million fungal inhabitants on Earth. These pathogens have diverged from the usual saprotrophic lifestyles of most fungi to colonize and infect humans and animals. Medical and veterinary mycology is the subdiscipline of microbiology that dwells into the mysteries of parasitic, fungal lifestyles. Among the oldest continuing scientific publications

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on the subject, *Mycopathologia* had its share of 'classic papers' since the first issue was published in 1938. An analysis of the eight decades of notable contributions reveals many facets of host–pathogen interactions among 183 volumes comprising about 6885 articles. We have analyzed the impact and relevance of this body of work using a combination of citation tools (Google Scholar and Scopus) since no single citation metric gives an inclusive perspective. Among the highly cited *Mycopathologia* publications, those on experimental mycology accounted for the major part of the articles (36%), followed by diagnostic mycology (16%), ecology and epidemiology (15%), clinical mycology (14%), taxonomy and classification (10%), and veterinary mycology (9%). The first classic publication, collecting nearly 200 citations, appeared in 1957, while two articles published in 2010 received nearly 150 citations each, which is notable for a journal covering a highly specialized field of study. An empirical analysis of the publication trends suggests continuing interests in novel diagnostics, fungal pathogenesis, review of clinical diseases especially with relevance to the laboratory scientists, taxonomy and classification of fungal pathogens, fungal infections and carriage in pets and wildlife, and changing ecology and epidemiology of fungal diseases around the globe. We anticipate that emerging and re-emerging fungal pathogens will continue to cause significant health burden in the coming decades. It remains vital that scientists and physicians continue to collaborate by learning each other's language for the study of fungal diseases, and *Mycopathologia* will strive to be their partner in this increasingly important endeavor to its 100th anniversary in 2038 and beyond.

Introduction

2018 marks the eightieth anniversary of the founding of *Mycopathologia* (Fig. 1). The founding editors Piero Redaelli and Raffaele Ciferri 'wanted to diffuse the understanding of fungal diseases in man and animals among mycologists' [1]. This was a critical mission considering that pathogenic fungi for humans and animals represent a tiny minority of the estimated 1.5–5 million fungal inhabitants on Earth [2]. These pathogens have diverged from the usual saprotrophic lifestyles of most fungi to colonize and infect human and animals. Medical and veterinary mycology is the subdiscipline of microbiology that deals with the mysteries of parasitic, fungal lifestyles. Much is now known about the etiology of fungal infections, and the diagnosis and treatment of fungal diseases due to the pioneering efforts of scientists and physicians. At the

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beginning of the journal, the availability of expertise was patchy around the globe as were the resources, and the integration with related disciplines remains a work in progress. *Mycopathologia,* one of the oldest scientific publications on the subject, has served the discipline well by enhancing the awareness and understanding of pathogenic fungi for humans and animals.

In the early years, *Mycopathologia* was closely associated with a large group of physicians and scientists responsible for laying the foundation of the 'modern era of medical mycology.' Earlier articles by the two former editors-in-chief, commemorating the twenty-fifth and fiftieth anniversaries of *Mycopathologia*, respectively, detailed the unique personalities of the early editorial teams and the extraordinary challenges they faced during the war years [1]. The narrative style of these editorials gave a rare behind the scene look at the personalities who were crucial during the formative years of the journal. The commemorative approach was common to that of other journals, an excellent example being the write-up of Edsall about the founding of the *Journal of Biological Chemistry* and its association with key discoveries in the life sciences [3]. For the eightieth anniversary, we decided to follow a different path in the style, wherein the *Management Science* journal celebrated its fiftieth anniversary by measuring the journal's metrics [4].

We summarize the most cited publications from the last eight decades of *Mycopathologia* to gauge the progress made on understanding medically important fungi. We also examined whether the longevity of *Mycopathologia* has any implications, especially in an era of the phenomenal growth of new journals for medically important fungi. Among the most common journal metrics, the impact factor (IF) and the total number of citations are widely used to gauge the impact on the field even though the citation counts remain an imperfect measurement [5]. We used two citation databases (Google Scholar and Scopus) to ensure good representations of the *Mycopathologia* articles [6]. This overview did not include non-English articles and articles describing mycotoxins and plant pathogenic fungi as they constitute a small proportion of nearly 6885 articles published in *Mycopathologia*.

Distribution of High Citations

We tallied 138 articles into six subcategories (Tables 1, 2) with fifty or more citations (Google Scholar or Scopus 1961–2018) (Tables 3, 4, 5, 6, 7, 8). The distribution of the articles was: experimental mycology (36% articles), diagnostic mycology (16%), ecology and epidemiology (15%), clinical mycology (14%), taxonomy and classification (10%), and veterinary mycology (9%) (Fig. 2). The geographic origin of highly cited articles showed that overwhelming numbers came from USA and Europe, which was especially true for the first 50 years of the journal (Fig. 3). Overall, twenty-five countries on four continents accounted for highly cited articles. This picture is evolving as the community and journal witness more contributions from parts of Africa, Asia, Australia, and South America.

Diagnostic Mycology

The challenges in diagnostic mycology received full attention in the initial issues of *Mycopathologia* with

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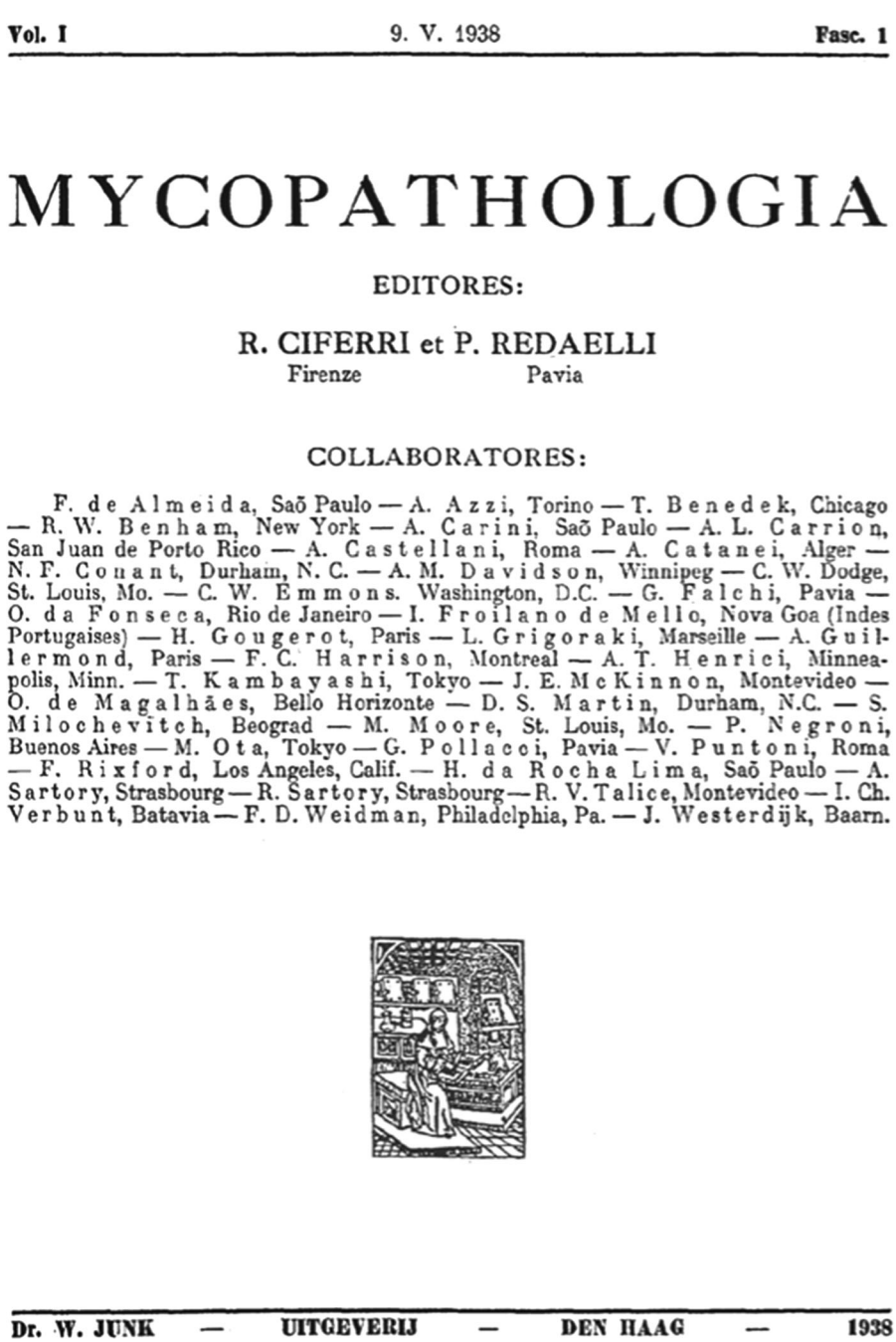

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Fig. 1 Title page of the first issue of *Mycopathologia* from 1938

the focus on the laboratory culture of oleaginous yeasts and the value of assimilation and fermentation tests for yeast identifications (Table 1) [7, 8]. Ajello and George [9] published the all-time classic in vitro hair perforation test for the laboratory differentiation of *Trichophyton mentagrophytes* from *T. rubrum* (Table 2). Nearly parallel to this discovery was the demonstration of the utility of monospecific antisera for laboratory identifications of yeasts by Tsuchiya et al. [10]. Further refinements of the serological methods were described such as micro-titration, immunoelectrophoresis, and ELISA (Tables 3, 4) [11–13]. The differentiation of fungal pathogens was refined by the applications of yeast killer toxins and

Table 1 Most cited articles published in *Mycopathologia* 1938–1950

	Title	Year	Subcategory	Citations[a]	References
1	The taxonomy of the anascosporous yeast-like fungi	1939	Taxonomy & classification	29/5	[120]
2	Some notes on *Torulopsis glabrata* (Anderson) nov. comb.	1938	Taxonomy & classification	25/10	[121]
3	*Trichophyton mentagrophytes* (*Pinoyella simii*) isolated from dermatophytosis in the monkey	1939	Veterinary mycology	25/5	[131]
4	On some sporogenous yeasts and their imperfect stages	1940	Taxonomy & classification	24/11	[122]
5	Cultivation of *Malassezia furfur*, etiological agent of pityriasis (tinea) versicolor	1938	Diagnostic mycology	20/8	[7]
6	An appeal for unification of the generic taxonomy in the *Mycotoruloideae*	1940	Taxonomy & classification	16/5	[124]
7	*Torulopsis* or *Cryptococcus*?	1938	Taxonomy & classification	14/6	[123]
8	Biological significance of the pseudomycelium in asporogenous yeasts	1943	Experimental mycology	7/3	[26]
9	Are fermentation tests and biochemical characteristics reliable in the differentiation of monilias?	1943	Diagnostic mycology	4/0	[8]
10	The classification of actinomycetes at the 3rd International Congress of Microbiology	1941	Taxonomy & classification	2/44	[141]

[a]Google Scholar/Scopus

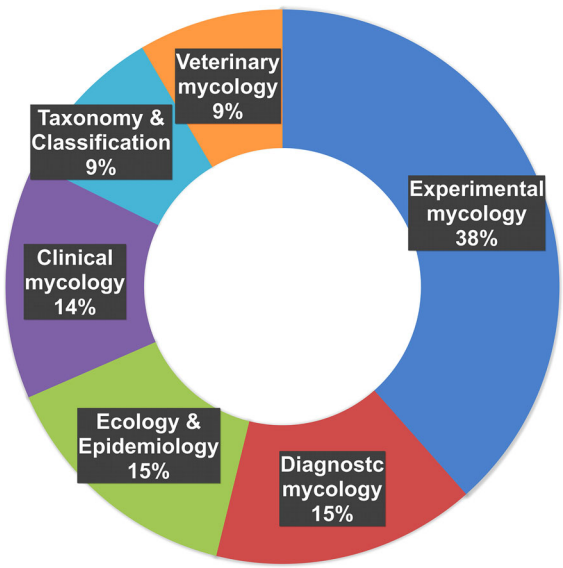

Fig. 2 Distribution of highly cited (> 50 citations in at least one database) publications from *Mycopathologia* (1961–2018)

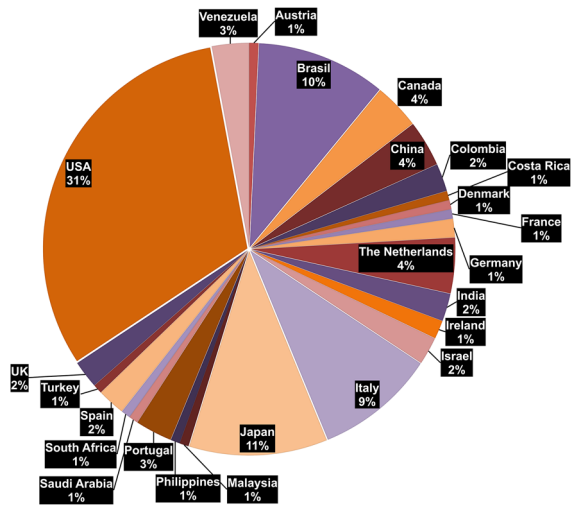

Fig. 3 Geographic distribution of most cited publications in *Mycopathologia* (1938–2018)

species-specific exoantigens [14, 15]. Morisita et al. [16] described an early implementation of the culture-independent, molecular diagnosis of pityriasis versicolor by deploying *Malassezia* species-specific nested PCR test. Another notable innovation was the application of mitochondrial DNA analysis for the typing of *Sporothrix schenckii* and related fungi

Table 2 Most cited articles published in *Mycopathologia* 1951–1960

	Title	Year	Subcategory	Citations[a]	References
1	In vitro hair cultures for differentiating between atypical isolates of *Trichophyton mentagrophytes* and *Trichophyton rubrum*	1957	Diagnostic mycology	194/60	[9]
2	Isolation of *Histoplasma capsulatum* from an oil bird (*Steatornis caripensis*) cave in Venezuela	1960	Ecology & epidemiology	64/17	[115]
3	A method for the rapid identification of the genus *Candida*	1959	Diagnostic mycology	61/20	[10]
4	*Cryptococcus neoformans* strains from a severe outbreak of bovine mastitis	1962	Veterinary mycology	41/7	[142]
5	*Candida albicans* infections in actively and passively immunized animals	1953	Experimental mycology	40/12	[41]
6	Successful infection of pigeons and chickens with *Histoplasma capsulatum*	1957	Experimental mycology	30/15	[40]
7	Studies of the dimorphism mechanism in *Saccharomyces cerevisiae*	1952	Experimental mycology	14/8	[57]
8	The comparison of four strains of *Coccidioides immitis* with diverse histories	1957	Experimental mycology	13/5	[42]
9	Effect of yeast extract, peptone, and certain nitrogen compounds on sporulation of *Saccharomyces cerevisiae*	1956	Experimental mycology	11/7	[58]
10	Inhibition of *Histoplasma capsulatum* and *Blastomyces dermatitidis* by *Pseudomonas aeruginosa* in vitro	1959	Experimental mycology	7/2	[27]

[a]Google Scholar/Scopus

(Tables 5, 6) [17, 18]. There were quite a few notable contributions on the laboratory susceptibility testing for antifungals and the relevance of molecular testing in the diagnostic laboratory (Tables 6, 7, 8) [19–22]. The description of new diagnostic technologies remains a favorite topic of *Mycopathologia* articles as the discipline moves into exciting areas such as whole genome sequencing, metagenomics, and proteomics [23–25].

Experimental Mycology

Experimental mycology included nearly one-third of all highly cited articles published in *Mycopathologia* starting with an article on yeast pseudomycelia in the very first issue (Table 1) [26]. The experimental results described in the journal covered all facets of medically important fungi and experimental disease models. Among the topics covered were antifungals and inhibitors [27–32], biofilms [33–39], immunity and virulence [25, 40–56], fungal structure, function, and nutrition [26, 57–67], and fungal metabolites and toxins [68–75]. The most common fungal pathogens investigated were *Candida albicans* and other *Candida* species followed by *Aspergillus fumigatus*, *Paracoccidioides brasiliensis*, *Cryptococcus neoformans*, *Blastomyces dermatitidis*, *Histoplasma capsulatum*, *Coccidioides immitis*, *Saccharomyces cerevisiae*, *Malassezia* species, *Rhizopus* species, *Sporothrix* species, and *Stachybotrys* species. These extensive collections of highly cited publications contain the reports of many trailblazing discoveries. Among the most remarkable publications in experimental mycology was the discovery of a linkage between *C. albicans* proteolysis and virulence by Staib (Table 3) [76]. *Candida* proteases are now widely recognized as crucial elements in the infectious processes [77, 78]. Similarly, Buffo et al. [63] described how temperature and pH regulate *C. albicans* yeast–hyphae transitions (Table 5). The Soll laboratory went on to discover the white-opaque colony phenotype switching, an important developmental pathway with crucial roles in the pathogenesis of candidiasis [79].

Table 3 Most cited articles published in *Mycopathologia* 1961–1970

	Title	Year	Subcategory	Citations[a]	References
1	Proteolysis and pathogenicity of *Candida albicans* strains	1969	Experimental mycology	108/33	[76]
2	A taxonomic study in the "black yeasts"	1962	Taxonomy & classification	104/49	[126]
3	Relation of the pigeon to cryptococcosis: natural carrier state, heat resistance and survival of *Cryptococcus neoformans*	1968	Ecology & epidemiology	101/34	[113]
4	The composition and structure of walls of dark fungus spores	1964	Experimental mycology	87/35	[59]
5	Preparation and properties of the endotoxins of *Aspergillus fumigatus* and Aspergillus flavus	1961	Experimental mycology	77/22	[68]
6	A survey of tide-washed coastal areas of southern California for fungi potentially pathogenic to man	1964	Ecology & epidemiology	65/23	[104]
7	Human pathogenic fungi recovered from Brazilian soil	1964	Ecology & epidemiology	64/21	[103]
8	Detection of antibodies by microtitrator techniques	1967	Diagnostic mycology	62/17	[11]
9	Lytic action of lysozyme on *Candida albicans*	1970	Experimental mycology	60/20	[28]
10	Biochemical and immunological studies on *Aspergillus*	1969	Experimental mycology	58/17	[60]
11	Thermophilous fungi of birds' nests	1967	Ecology & epidemiology	57/24	[116]
12	An evaluation of various environmental factors affecting the propagation of *Cryptococcus neoformans*	1968	Experimental mycology	55/13	[61]
13	Systematics of yeast species in the *Candida parapsilosis* group	1967	Taxonomy & classification	52/25	[143]

[a]Google Scholar/Scopus

Clinical Mycology

Clinical mycology articles with high citations were few and far between in the earlier decades of publication of *Mycopathologia* most likely because as large case series were not compiled or were published in more clinically oriented journals. The first noteworthy contribution appeared in 1976 on a clinical model of paracoccidioidomycosis based upon a detailed analysis of 46 cases of the disease (Table 4) [80]. The relevance of the clinical model was enhanced subsequently by other investigators with detailed descriptions of the immunopathology of paracoccidioidomycosis [81–83]. In the early 1970s, an influential publication described the higher prevalence of pathogenic fungi including known agents of onychomycosis in toenails and toe-webs of diabetic patients [84]. Similarly, Vález and Diaz [85] highlighted the role of saprobic fungi as agents of onychomycosis, and Godoy and colleagues [86] highlighted *Fusarium solani* and *F. oxysporum* as agents of onychomycosis (Tables 5, 7). Gupta and Cooper [87] had the unique distinction of publishing the highest cited *Mycopathologia* article to date that described the antifungal therapy of dermatophytosis (Table 7). Uribe et al. [88] characterized the histopathological changes presented at different stages of chromoblastomycosis, a significant tropical disease caused by black molds. A subsequent publication by Silva et al. [89] documented the extent of chromoblastomycosis in Amazon region with a predominance of *Fonsecaea pedrosoi* (Table 6). Queiroz-Telles and Santos [90] published an expert opinion on the treatment challenges and available options for chromoblastomycosis in resource-poor parts of the world. Finally, a valuable addition to the growing collection

Table 4 Most cited articles published in *Mycopathologia* 1971–1980

	Title	Year	Subcategory	Citations[a]	References
1	Serologic aspects on yeast classification	1974	Taxonomy & classification	176/72	[127]
2	Natural history of the dermatophytes and related fungi	1974	Ecology & epidemiology	146/59	[107]
3	*Paracoccidioides brasiliensis*: cell wall structure and virulence	1977	Experimental mycology	125/50	[43]
4	Chemical and immunological properties of galactomannans obtained from *Histoplasma duboisii*, *Histoplasma capsulatum*, *Paracoccidioides brasiliensis* and *Blastomyces dermatitidis*	1974	Experimental mycology	96/26	[62]
5	Pathogenesis of Paracoccidioidomycosis: a model based on the study of 46 patients	1976	Clinical mycology	92/33	[80]
6	A modern system of *Fusarium* taxonomy	1974	Taxonomy & classification	91/21	[144]
7	Prevalence of pathogenic fungi in the toe-webs and toe-nails of diabetic patients	1979	Clinical mycology	87/34	[84]
8	Activation of the alternative pathway of complement by *Malassezia ovalis* (*Pityrosporum ovale*)	1980	Experimental mycology	80/33	[44]
9	Comparative recoveries of airborne fungus spores by viable and non-viable modes of volumetric collection	1977	Ecology & epidemiology	74/33	[109]
10	Comparison by ELISA of serum anti-*Candida albicans* mannan IgG levels of a normal population and in diseased patients	1980	Diagnostic mycology	68/25	[13]
11	Counterimmunoelectrophoresis as a routine mycoserological procedure	1975	Diagnostic mycology	50/18	[12]

[a]Google Scholar/Scopus

of high-impact publications on chromoblastomycosis came from Lyon et al. [91] who showed clinical evidence of the effectiveness of photodynamic therapy in ten patients (Table 8). Queiroz-Telles' group have continued their productive work on chromoblastomycosis with a recent update in Clinical Microbiology Reviews [92].

A relatively recent overview of candidiasis by Martins and colleagues [93] was well received for its emphasis on predisposition, prevention and control, and the role of alternative treatment approaches (Table 8). A brief report on the etiologic role of *C. albicans* in otitis externa received notable citations given enhanced interests in the multidrug resistance *C. auris* from aural specimens [94, 95]. The reviews of cryptococcosis in Brazil by Rozenbaum et al. [96] and in China by Chen et al. [97] received high citations (Tables 6, 8). The authors highlighted the distribution of different *Cryptococcus* pathogenic species and molecular genotypes among patients with or without underlying immune deficiencies. The disease pattern in these geographically diverse countries with large populations differed from earlier knowledge of the disease reported from North America. Xi et al. [98] provided a comprehensive clinical and mycological profile of penicilliosis due to *Talaromyces* (*Penicillium*) *marneffei* from Guangdong, China, with strong supportive evidence for the natural distribution of the fungus in Southeast China (Table 7). Xi's group expanded their excellent overview of the penicilliosis by classifying it as an important emerging disease in China [99]. Other notable contributions in clinical mycology were the overview of filamentous fungal infections among patients receiving hematopoietic stem cell therapy, appropriate laboratory diagnostic methods for coccidioidomycosis, and clinical efficacy and relevance of isavuconazole, then a new triazole antifungal (Table 7) [100–102].

Ecology and Epidemiology

The ecology and epidemiology subcategory articles have few common themes: the natural occurrence of pathogenic fungi in the soil, air, and water in diverse

Table 5 Most cited articles published in *Mycopathologia* 1981–1990

	Title	Year	Subcategory	Citations[a]	References
1	A characterization of pH-regulated dimorphism in *Candida albicans*	1984	Experimental mycology	241/97	[63]
2	Decreased virulence in stable, acapsular mutants of *Cryptococcus neoformans*	1982	Experimental mycology	191/68	[45]
3	Variation in adhesion and cell surface hydrophobicity in *Candida albicans* white and opaque phenotypes	1988	Experimental mycology	109/40	[64]
4	A survey of dermatophytes isolated from human patients in the United States from 1979 to 1981 with chronological listings of worldwide incidence of five dermatophytes often isolated in the United States	1984	Ecology & epidemiology	91/63	[108]
5	Strain differentiation of pathogenic yeasts by the killer system	1984	Diagnostic mycology	83/34	[14]
6	Fungi in bathwater and sludge of bathroom drainpipes	1987	Ecology & epidemiology	81/45	[118]
7	Studies on a saprophyte of *Exophiala dermatitidis* isolated from a humidifier	1982	Experimental mycology	80/35	[65]
8	In vivo and in vitro characteristics of six *Paracoccidioides brasiliensis* strains	1985	Experimental mycology	79/48	[46]
9	Experimental pulmonary paracoccidioidomycosis in mice: Morphology and correlation of lesions with humoral and cellular immune response	1982	Experimental mycology	78/35	[47]
10	Analysis of restriction profiles of Mitochondrial DNA from *Sporothrix schenckii* and related fungi	1988	Diagnostic mycology	77/26	[18]
11	Virulence of *Paracoccidioides brasiliensis*: The influence of in vitro passage and storage	1990	Experimental mycology	77/39	[48]
12	Preservation of fungi in water (Castellani): 20 years	1989	Diagnostic mycology	73/35	[145]
13	*Penicillosis marneffei*: Serological and exoantigen studies	1982	Diagnostic mycology	69/29	[15]
14	Effects of iron and desferrioxamine on *Rhizopus* infection	1990	Experimental mycology	69/28	[56]
15	T-cell dysfunction and hyperimmunoglobulinemia E in paracoccidioidomycosis	1982	Clinical mycology	67/27	[81]
16	Onychomycosis due to saprophytic fungi	1985	Clinical mycology	63/34	[85]
17	Survey of the mycoflora of desert soils in Saudi Arabia	1982	Ecology & epidemiology	61/25	[105]
18	Histopathology of chromoblastomycosis	1989	Clinical mycology	61/30	[88]
19	Keratinophilic fungi isolated from Antarctic soil	1989	Ecology & epidemiology	61/23	[106]
20	Circulating immune complexes and in vitro cell reactivity in paracoccidioidomycosis	1982	Clinical mycology	58/63	[82]
21	Morphogenesis throughout saprobic and parasitic cycles of *Coccidioides immitis*	1982	Experimental mycology	57/22	[66]
22	Isolation of *Phialophora verrucosa* and *Fonsecaea pedrosoi* from nature in Japan	1981	Ecology & epidemiology	56/21	[146]
23	Granuloma formation and killing functions of granuloma in congenitally athymic nude mice infected with *Blastomyces dermatitidis* and *Paracoccidioides brasiliensis*	1983	Experimental mycology	52/25	[49]

[a]Google Scholar/Scopus

Table 6 Most cited articles published in *Mycopathologia* 1991–2000

	Title	Year	Subcategory	Citations[a]	References
1	Airborne fungal colony-forming units in outdoor and indoor environments in Yokohama, Japan	1997	Ecology & epidemiology	165/75	[110]
2	Chromoblastomycosis: a retrospective study of 325 cases on Amazonic Region (Brazil)	1998	Clinical mycology	140/74	[89]
3	Differentiation of three biotypes of *Malassezia* species on human normal skin. Correspondence with *M. globosa*, *M. sympodialis* and *M. restricta*	1999	Diagnostic mycology	91/32	[147]
4	Extracellular proteolytic activity of *Cryptococcus neoformans*	1994	Experimental mycology	79/34	[69]
5	The time course of responses to intratracheally instilled toxic *Stachybotrys chartarum* spores in rats	2000	Experimental mycology	74/29	[50]
6	Effect of nucleosides and nucleotides and the relationship between cellular adenosine 3′:5′-cyclic monophosphate (cyclic AMP) and germ tube formation in *Candida albicans*	1992	Experimental mycology	70/28	[67]
7	Occurrence of *Penicillium marneffei* infections among wild bamboo rats in Thailand	1995	Ecology & epidemiology	68/30	[117]
8	Microbiological characteristics and susceptibility patterns of strains of *Rhodotorula* isolated from clinical samples	1999	Diagnostic mycology	66/32	[19]
9	Prevalence, epidemiology and geographical distribution of *Sporothrix schenckii* infections in Gauteng, South Africa	1997	Ecology & epidemiology	62/32	[148]
10	Phospholipase activity in *Cryptococcus neoformans*	1996	Experimental mycology	61/25	[70]
11	Clinical isolates of yeast produce a gliotoxin-like substance	1991	Experimental mycology	58/16	[71]
12	*Cryptococcus neoformans* varieties as agents of cryptococcosis in Brazil	1992	Clinical mycology	58/24	[96]
13	The antifungal action of dandruff shampoos	1999	Experimental mycology	58/22	[29]
14	In vitro activity of a new triazole antifungal agent, Sch 56592, against clinical isolates of filamentous fungi	1998	Experimental mycology	56/26	[30]
15	Effects of dietary sugars and saliva and serum on *Candida* biofilm formation on acrylic surfaces	1997	Experimental mycology	54/20	[33]
16	Evaluation of two vaccines for the treatment of pythiosis insidiosi in horses	1992	Veterinary mycology	52/27	[149]
17	Mushroom worker's lung: serologic reactions to thermophilic actinomycetes present in the air of compost tunnels	1993	Clinical mycology	54/22	[150]
18	Hyperthermic treatment of chromomycosis with disposable chemical pocket warmers	1993	Clinical mycology	52/23	[151]
19	Mitochondrial DNA analysis of *Sporothrix schenckii* in North and South America	1998	Diagnostic mycology	50/22	[17]

[a]Google Scholar/Scopus

habitats; the association of fungal pathogens with birds and other animals in nature; and the epidemiology of dermatophytosis (Tables 2, 3, 4, 5). The evolving appreciation for the extensive occurrence of pathogenic fungi in soil was reinforced with well-documented reports from California, Brazil, Saudi Arabia, and Antarctica [103–106]. Ajello's natural history of dermatophytes and related fungi, a citation classic, is a comprehensive description of the natural habitats of *Epidermophyton*, *Microsporum*, and *Trichophyton* since their earliest recognition in 1847 [107]. Sinski and Flouras [108] provided a global

Table 7 Most cited articles published in *Mycopathologia* 2001–2010

	Title	Year	Subcategory	Citations[a]	References
1	Update in antifungal therapy of dermatophytosis	2008	Clinical mycology	281/120	[87]
2	In vitro antifungal activities of voriconazole and reference agents as determined by NCCLS methods: Review of the literature	2001	Diagnostic mycology	278/133	[20]
3	The new species concept in dermatophytes—a polyphasic approach	2008	Taxonomy & classification	211/115	[128]
4	The inhibition of *Candida albicans* by selected essential oils and their major components	2005	Experimental mycology	191/79	[31]
5	Antifungal resistance mechanisms in dermatophytes	2008	Clinical mycology	177/71	[152]
6	Correlation between gliotoxin production and virulence of *Aspergillus fumigatus* in *Galleria mellonella*	2004	Experimental mycology	145/85	[72]
7	Presence of extracellular DNA in the *Candida albicans* biofilm matrix and its contribution to biofilms	2010	Experimental mycology	145/95	[34]
8	An overview of the immunopathology of human paracoccidioidomycosis	2008	Clinical mycology	130/76	[83]
9	In vitro activity of eugenol against *Candida albicans* biofilms	2007	Experimental mycology	121/51	[35]
10	Isolation of *Malassezia globosa* and *M. sympodialis* from patients with pityriasis versicolor in Spain	2002	Diagnostic mycology	110/40	[153]
11	Isavuconazole: A Comprehensive Review of Spectrum of Activity of a New Triazole	2010	Clinical mycology	109/61	[102]
12	Serologic testing for symptomatic coccidioidomycosis in immunocompetent and immunosuppressed hosts	2006	Clinical mycology	100/64	[101]
13	Biodiversity and concentration of airborne fungi in a hospital environment	2001	Ecology & epidemiology	95/32	[111]
14	Occurrence and population size of *Malassezia* spp. in the external ear canal of dogs and cats both healthy and with otitis	2005	Veterinary mycology	92/33	[132]
15	Molecular analysis of *Malassezia* microflora from patients with pityriasis versicolor	2006	Diagnostic mycology	92/51	[16]
16	The use of new probes and stains for improved assessment of cell viability and extracellular polymeric substances in *Candida albicans* biofilms	2005	Experimental mycology	87/49	[36]
17	Occurrence of yeasts in cloacae of migratory birds	2006	Veterinary mycology	86/53	[137]
18	Serology of paracoccidioidomycosis	2008	Diagnostic mycology	86/35	[154]
19	*Sporothrix schenckii* isolated from domestic cats with and without sporotrichosis in Rio de Janeiro, Brazil	2002	Veterinary mycology	85/45	[136]
20	Invasive filamentous fungal infections in allogeneic hematopoietic stem cell transplant recipients after recovery from neutropenia: Clinical, radiologic, and pathologic characteristics	2005	Clinical mycology	84/40	[100]
21	Acid proteinase, phospholipase, and biofilm production of *Candida* species isolated from blood cultures	2007	Experimental mycology	82/43	[155]
22	Isolation and toxigenicity of *Aspergillus fumigatus* from moldy silage	2003	Ecology & epidemiology	81/44	[119]
23	*Cryptococcus neoformans* and *Cryptococcus gattii* isolated from the excreta of *Psittaciformes* in a Southern Brazilian zoological garden	2006	Veterinary mycology	81/35	[138]
24	High rate of *Microsporum canis* feline and canine dermatophytoses in Northeast Brazil: epidemiological and diagnostic features	2003	Veterinary mycology	76/21	[133]

Table 7 continued

	Title	Year	Subcategory	Citations[a]	References
25	Inhibition on *Candida albicans* biofilm formation using divalent cation chelators (EDTA)	2007	Experimental mycology	75/34	[37]
26	Dermatophytes isolated from symptomatic dogs and cats in Tuscany, Italy during a 15-year-period	2003	Veterinary mycology	74/33	[134]
27	Fifteen cases of penicilliosis in Guangdong, China	2004	Clinical mycology	74/31	[98]
28	Influence of Th1/Th2 cytokines and nitric oxide in murine systemic infection induced by *Sporothrix schenckii*	2006	Experimental mycology	71/38	[51]
29	Effect of pre-incubation temperature on susceptibility of *Galleria mellonella* larvae to infection by *Candida albicans*	2008	Experimental mycology	71/46	[52]
30	Phospholipase and proteinase activities of clinical isolates of *Candida* from immunocompromised patients	2006	Experimental mycology	70/42	[73]
31	Examination of potential virulence factors of *Candida tropicalis* clinical isolates from hospitalized patients	2010	Experimental mycology	70/42	[158]
32	In Vitro investigation of antifungal activity of allicin alone and in combination with azoles against *Candida* Species	2010	Experimental mycology	66/20	[32]
33	Occurrence of *Malassezia* species in healthy and dermatologically diseased dogs	2004	Veterinary mycology	65/23	[135]
34	Melanization decreases the susceptibility of *Cryptococcus neoformans* to enzymatic degradation	2001	Experimental mycology	64/32	[74]
35	Susceptibility of larvae of *Galleria mellonella* to infection by *Aspergillus fumigatus* is dependent upon stage of conidial germination	2006	Experimental mycology	61/44	[54]
36	Onychomycosis caused by *Fusarium solani* and *Fusarium oxysporum* in São Paulo, Brazil	2004	Clinical mycology	63/29	[86]
37	Metabolite profiles of *Stachybotrys* isolates from water-damaged buildings and their induction of inflammatory mediators and cytotoxicity in macrophages	2002	Ecology & epidemiology	61/35	[112]
38	Epidemiology and molecular typing of *Candida* isolates from burn patients	2004	Ecology & epidemiology	61/26	[156]
39	Design of a simple model of *Candida albicans* biofilms formed under conditions of flow: development, architecture, and drug resistance	2009	Experimental mycology	61/36	[38]
40	Ecology of dermatophytes and other keratinophilic fungi in swimming pools and polluted and unpolluted streams	2003	Ecology & epidemiology	58/22	[157]
41	Etiological Significance of *Candida albicans* in Otitis Externa	2003	Clinical mycology	58/15	[94]
42	Animal models of allergic bronchopulmonary aspergillosis	2002	Experimental mycology	57/19	[55]

[a]Google Scholar/Scopus

picture of the distribution of dermatophytic fungi by comparing their occurrence in the US patients vis-à-vis clinical reports from other parts of the world. The aerial prevalence of fungal pathogens over cities was reported with sophisticated samplers, and the role of aerial microbiota inside the hospitals and damp buildings was correlated with the occurrence of fungal diseases [109–112]. Littman and Borok [113] brought scientific rigor to the known association of pigeons with *Cryptococcus neoformans* by carefully delineating the heat tolerance of the pathogen, its survival in the pigeon body and excreta, and the possible carrier role that pigeons play in the urban environments. Over 40 years later, another notable contribution on cryptococcosis was published and concerned the unique ecological niche of *Cryptococcus gattii* on trees found on the Vancouver Island, British Columbia, Canada (Table 8) [114]. Additional bird associations were

Table 8 Most cited articles published in *Mycopathologia* 2011–2018

	Title	Year	Subcategory	Citations[a]	References
1	*Penicillium marneffei* infection: an emerging disease in mainland China	2013	Clinical mycology	98/57	[99]
2	Candidiasis: predisposing factors, prevention, diagnosis and alternative treatment	2014	Clinical mycology	88/48	[93]
3	Isavuconazole and nine comparator antifungal susceptibility profiles for common and uncommon *Candida* Species collected in 2012: application of new CLSI clinical breakpoints and epidemiological cutoff values	2014	Diagnostic mycology	88/16	[21]
4	Toward a novel multilocus phylogenetic taxonomy for the dermatophytes	2017	Taxonomy & classification	60/43	[129]
5	Isolation and screening of black fungi as degraders of volatile aromatic hydrocarbons	2013	Experimental mycology	58/37	[75]
6	A Decade of Experience: *Cryptococcus gattii* in British Columbia	2012	Ecology & epidemiology	54/32	[114]
7	Cryptococcosis in China (1985–2010): review of cases from Chinese database	2012	Clinical mycology	54/27	[97]
8	*Aspergillus* cell wall and biofilm	2014	Experimental mycology	54/38	[39]
9	Challenges in the therapy of chromoblastomycosis	2013	Clinical mycology	53/25	[90]
10	Photodynamic antifungal therapy against chromoblastomycosis	2011	Clinical mycology	52/33	[91]
11	Significance of molecular identification and antifungal susceptibility of clinically significant yeasts and moulds in a global antifungal surveillance programme	2012	Diagnostic mycology	51/30	[22]

[a]Google Scholar/Scopus

reported for *Histoplasma capsulatum* from Venezuela and thermophilic fungi with the passerine bird species in Britain [115, 116]. Among other notable publications in ecology and epidemiology were *Talaromyces* (*Penicillium*) *marneffei* isolated from bamboo rats in Thailand, black yeasts in public bathwater from Japan, and *Aspergillus fumigatus* in moldy silage on the Azores Islands (Tables 6, 7) [117–119].

Taxonomy and Classification

Taxonomy and classification especially related to yeasts dominated the initial volumes of *Mycopathologia* [120–123], and there was an appeal to unify taxonomy, a theme familiar to many of us even today (Table 1) [124, 125]. However, the high-impact contributions to taxonomy and classification in the coming decades were not that many except for the two remarkable contributions on the black yeasts and the serological approaches to yeast classification based upon cell surface antigens (Table 3) [126, 127]. This subcategory has undergone a sort of rejuvenation in *Mycopathologia* with two articles in the last decade by Profs. de Hoog, Gräser and their colleagues on the re-appraisal of taxonomy and species concept in dermatophytes (Tables 7, 8) [128, 129]. The very high citations and downloads of the two articles suggested that high-quality communications on the taxonomy and classification of medically important fungi remained relevant as this area is transformed with the applications of genome sequencing [130].

Veterinary Mycology

Veterinary mycology-associated reports first appeared in the inaugural issue of *Mycopathologia* and concerned a case of simian dermatophytosis (Table 1) [131]. This subcategory remained underrepresented until recently. However, the last decade marked the publication of many important descriptions of dermatophytosis, *Malassezia* and S*porothrix* carriage in

dogs and cats, respectively (Table 7) [132–136]. There were also notable reports on birds as the carriers of yeasts, especially *Cryptococcus* species [137, 138]. It is clear that veterinary mycology will be crucial in the coming years because of the emerging consensus on One Health approaches for the welfare of the animal and human health [139].

Concluding Remarks

As we conclude this commemorative article, it is pertinent to ask whether *Mycopathologia* has met its original mission, if the journal is still providing valuable services to the scientists and physicians interested in pathogenic fungi, and finally, what changes will come as *Mycopathologia* moves toward its hundredth anniversary in 2038? The answer is an emphatic yes! For the first question with an archive of nearly 6885 articles online and in print (Fig. 2), and each issue continuing the tradition of publishing a mix of articles on pathogenic fungi and fungal diseases. The answer to the second question is complicated as there are many more journals and options for sharing new developments on pathogenic fungi. Thus, *Mycopathologi*a has to seek and share interesting articles with other journals. This is easier to implement, as the investigations of pathogenic fungi have grown manifold with a significant upsurge from the authors in Africa, Asia, and South America (Fig. 3). They are also well represented in the *Mycopathologia* Editorial Board with more than half of the editors coming from the areas outside of Europe and North America as mentioned earlier. Further answers to questions two and three are tied to the technical and business strengths of our publisher Springer Nature. The publisher is at the forefront of technological changes and business evolution, and indeed, *Mycopathologia* would be a beneficiary from being part of this progressive company. In recent years, the journal has devoted one-third of its pages annually to the special issues, which bring together recognized experts on a selected topic, and this feature will be further enhanced along with a new feature *Mycopathologia* Images. We anticipate that emerging and re-emerging fungal pathogens will continue to cause significant health burden in the coming decades [140]. It is, therefore, vital that scientists and physicians continue to collaborate by learning each other's language for the study of fungal diseases, and *Mycopathologia* will strive to be their partner in this endeavor to its 100th anniversary in 2038 and beyond.

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