Staff Meeting Bulletin Hospitals of the » » » University of Minnesota

Moniliasis

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INDEX

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I.

UNIVERSITY OF MINNESOTA MEDICAL SCHOOL
CALENDAR OF EVENTS

February 24 - March 1, 1947

No. 146

Monday, February 24

9:00 - 9:50 Roentgenology-Medicine Conference; L. G. Rigler, C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 10:50 Obstetrics and Gynecology Conference; J. L. McKelvey and Staff; Interns' Quarters, U. H.

10:00 - 12:00 Neurology Ward Rounds; A. B. Baker and Staff; Station 50, U. H.

11:00 - 11:50 Roentgenology-Medicine Conference; Veterans' Hospital.

11:00 - 11:50 Physical Medicine Conference; Electricity in physical medicine; William G. Kubicek; W-200 U. H.

12:15 - 1:15 Obstetrics and Gynecology Journal Club; M-435, U. H.

12:30 - 1:20 Pathology Seminar; The kidney in eclampsia; Jerome Smersh; 104 I. A.

12:15 - 1:30 Pediatrics Seminar; Differential diagnoses of speech disorders; Ellsworth Stenswick; 6th Floor Seminar Room, Eustis Amphitheater, U.H.

12:00 - 12:50 Physiology Seminar; Problems of Physiological Significance under Study at the Hormel Institute; H. O. Halvorson; 214 M. H.

4:00 - 4:50 School of Public Health Seminar; Disinfection of Air; H. A. Whittaker; 214 M H.

Tuesday, February 25

9:00 - 9:50 Roentgenology-Pediatrics Conference; L. G. Rigler, I. McQuarrie and Staff; Eustis Amphitheater, U. H.

10:30 - 11:20 Surgery Seminar; John R. Paine; Small Conference Room, Bldg. I, Veterans' Hospital.

12:30 - 1:20 Pathology Conference; Autopsies; Pathology Staff; 102 I. A.

2:00 - 2:50 Dermatology and Syphilology; H. E. Michelson and Staff; Veterans' Hospital, Bldg. III.

3:15 - 4:15 Gynecology Chart Conference; J. L. McKelvey and Staff; Station 54, U. H.

3:30 - 4:20 Clinical Pathological Conference; Veterans' Hospital.

3:45 - 4:50 Pediatrics Staff Rounds; I. McQuarrie and Staff; W-205, U. H.

4:00 - 4:50 Surgery-Physiology Conference; Cerebral edema; Donald R. Simmons and Ernst Gellhorn; Eustis Amphitheater, U. H.

5:00 - 5:50 Roentgenology Diagnosis Conference; Ancker Hospital.

8:00 - Minnesota Pathological Society; Recent Studies on the Function of the Adrenal Cortex; C. N. H. Long, Yale University; Medical Science Amphitheater.

Wednesday, February 26

8:00 - 8:50 Surgery Journal Club; O. H. Wangensteen and Staff; M-515, U. H.

8:30 - 10:00 Psychiatry and Neurology Seminar; Staff; Station 60 Lounge, U. H.

11:00 - 11:50 Pathology-Medicine-Surgery Conference; Carcinoma head of pancreas; E. T. Bell, C. J. Watson, O. H. Wangensteen and Staff; Todd Amphitheater, U. H.

12:00 - 1:00 Physiological Chemistry Journal Club; Staff; 116 M. H.

4:00 - 6:00 Medicine and Pediatrics Infectious Disease Rounds; W-205, U. H.

Thursday, February 27

8:30 - 9:20 Surgery Grand Rounds; John R. Paine and Staff; Veterans' Hospital.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; Todd Amphitheater, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:20 Roentgenology-Surgery Conference; Staff; Veterans' Hospital.

12:00 - 12:50 Physiological Chemistry Seminar; Polarographic and Related Electrometric Methods; Cyrus P. Barnum, Jr.; 214 M. H

4:30 - 5:20 Ophthalmology Ward Rounds; Erling W. Hansen and Staff; E-534, U. H.

4:00 - 4:50 Bacter ology Seminar; The Action of Microorganisms on Fats; Mr. James J. Jezeski; 214 M. H.

5:00 - 5:50 Roentgenology Seminar; Induction of Mouse Leukemia; Harry W. Mixer and Arthur Kirschbaum; M-515, U. H.

Friday, February 28

9:00 - 9:50 Medicine Grand Rounds; C. J. Watson and Staff; Todd Amphitheater, U. H.

9:00 - 9:50 Pediatric Grand Rounds; I. McQuarrie and Staff; Eustis Amphitheater.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; E-221, U. H.

10:30 - 11:20 Medicine Grand Rounds; Staff; Veterans' Hospital.

10:30 - 12:20 Otolaryngology Case Studies; L. R. Boies and Staff; Out-Patient Otolaryngology Department; U.H.

11:30 - 1:00 University of Minnesota Hospitals General Staff Meeting; Poliomyelitis in Minnesota; Dean S. Fleming; New Powell Hall Amphitheater.

1:00 - 1:50 Dermatology And Syphilology; Presentation of Selected Cases of the Week; H. E. Michelson and Staff; W-312, U. H.

1:00 - 2:50 Roentgenology-Neurosurgery Conference; H. O. Peterson, W. T. Peyton and Staff; Todd Amphitheater, U. H.

Saturday, March 1

7:45 - 8:50 Orthopedics Conference; Wallace H. Cole and Staff; Station 21, U. H.

9:00 - 10:00 Neurology Grand Rounds; A. B. Baker and Staff; Station 50, U. H.

9:00 - 9:50 Surgery-Roentgenology Conference; O. H. Wangensteen, L. G. Rigler, and Staff; Todd Amphitheater, U. H.

9:00 - 9:50 Medicine Case Presentation; C. J. Watson and Staff; M-515, U. H.

10:00 - 11:50 Medicine Ward Rounds; C. J. Watson and Staff; M-515, U. H.

10:00 - 12:50 Obstetrics and Gynecology Grand Rounds; J. L. McKelvey and Staff; Station 44, U. H.

11:00 - 12:20 Anatomy Seminar; The effect of strychnine on the central nervous system; John B. Hyde: Renal glomerular and tubular function tests; Jack Gordon; 226 I. A.

II. AUTOPSY REPORT - July - December, 1946

Service	Deaths	Coroner's Cases	Stillbirths	Number	Autopsies	Percentage
Surgery	33	3		30	24	80%
Neurosurgery	12			12	10	83%
Urology	8			8	8	100%
White Surgery	5			5	4	80%
Orthopedics	1	1				--
Medicine	52	1		51	41	80%
Neurology	42			42	37	83%
Health Service	2			2	2	100%
Pediatrics	73	3		70	63	90%
Stillborn	5		5			--
Gynecology	4			4	3	75%
	237	8	5	224	192	86%

Month	Deaths	Cases	Stillbirths	Number	Autopsies	Percentage
July	31	1	1	29	26	89%
August	46	2		44	33	75%
September	39		1	38	35	92%
October	44	2	1	41	35	85%
November	43	2	1	40	35	87%
December	34	1	1	32	28	87%
	237	8	5	224	192	86%

III. MONILIASIS

C. E. Skinner

Candida albicans, the causative agent of thrush and various other infections was first connected with a disease of man in 1847, just 100 years ago. Eight years later it was given its first Latin binomial, Oidium albicans. It definitely is not an Oidium. Still later it was given the name Monilia albcans. Certainly it is not a Monilia. The generic name Monilia has been widely used for more than a century and is still widely used for entirely different fungi which only superficially resemble the organism in question. At a meeting of a committee at the International Microbiological Congress of 1939, at New York, it was agreed to use the name Candida albicans, bypassing the valid but little used "Syringospora albicans" and to have the generic name Candida validated as a nomen conservandum at the next International Botanical Congress. Practically all recent authors on medical mycology have accepted this decision.

Candida albicans is extremely variable in morphology and degenerates (dissociates) morphologically so frequently in culture that variants of the same species have frequently been classified by the same person into a number of species or genera. This variability of morphology (together with the fact that it seems to have been a common practice for medical bacteriologists to ignore previous names and to coin new ones, and for botanists to completely ignore the medical literature), has resulted in an enormous synonomy for one and the same fungus. Ciferri, Redaelli and Cavallero in 1938 found in the literature 45 Latin binomials for the organism, Diddens and Lodder found 87, and Conant and associates state that there are 172!

Candida albicans is a yeast. Grown on the ordinary sugar peptone agar, e.g., Sabouraud agar, it grows exclusively as a typical budding asporogenous yeast. Grown at optimum (25° - 30°) temperatures on starvation media (potato or corn meal infusion agar) it forms also a few strands of mycelium from which yeastlike cells sprout. These are known as blastospores. Terminal chlamydospores also are characteristically found. These latter distinguish this pathogenic species from the 20 or so nonpathogenic species. C. albicans also can be distinguished from the other species by its fermentive and other biochemical characters, but the tests must be carried out by special methods of which most bacteriologists are not aware.

Two recent books have cleared the mycology and taxonomy of this heretofore difficult group: "Die Anaskosporogen Hefen. Zweite Hälfte", a large volume of 500 pages by Diddens and Lodder published in 1942, and a smaller volume of 1946 more specifically devoted to the medical aspects of the subject, "Zimologia Médica" by Juan Enrique Mackinnon. A review of some 300 papers is in press in Bacteriological Reviews and much of the following is a paraphrase of portions of this review.

Moniliasis is a general name for any infection due to any species of Candida. It is hoped that the tendency to change the name of a disease to follow taxonomic changes will not extend to this infection. Thrush (or other oral moniliases) is the best known form of the infection but others are known, such as those of the nails or of the skin, about the mouth, under the arm pits, in the inframammary region, the groin, the hands and especially the feet. Candida vaginitis and vulvitis and Candida infections of the respiratory tract are also well established as clinical entities. Infections involving the meninges and the heart are very rare, and intestinal moniliasis has been described, but its existence is doubtful. It will probably be unnecessary to recommend the recent and excellent "Handbook of Medical Mycology" by Conant, Martin, Smith, Baker and Calloway, not only for the concise clinical discussion but the mycology as well.

Thrush (Soor, muguet) an infection of the mucous surfaces of the mouth, is well known and the causative agent generally accepted as being Candida albicans. Moniliasis connected with other conditions of the oral cavity are not so well known. Although it is

admitted that thrush is specifically caused by C. albicans, the laboratory diagnosis is not always easy to make, and the same thing is true for other moniliases of the mouth. It is easy to demonstrate yeastlike cells from the cheek, tongue, lips, teeth, etc. to isolate them and grow them on Sabouraud agar as yeasts, or even to identify them as C. albicans in corn meal agar or other appropriate media. The diagnosis of moniliasis is complicated by the fact that C. albicans is present in a number of apparently healthy mouths or is present as a secondary invader in other pathological conditions. De Stocklin found that of 330 diphtheritic angina cases, 19 yielded "Saccharomyces albicans" and of 170 angina cases which were non-diphtheritic, 18 yielded this parasite. Epstein found that 54% of the mouths of a large series of children of 2-6 weeks yielded the "Soorpilz", 46.5% up to 1 year, 38.5%, 1-6 year age group. The often cited paper of Tanner, Lampert and Lampert is so inadequate on the taxonomic side that all that may be deduced is that only 10% of the mouths or throats of 1002 healthy young adults yielded yeasts of some sort. These data like those of Kiefer are in contrast to those of most workers who have found a much higher percentage of yeasts, especially C. albicans in normal mouths. Fisher found that of 48 children, the throats of 12 and the tongues of 6 yielded C. albicans. Of 28 adults, the mouths of 6 and the tongues of 3 were positive for the species. Thirty samples of saliva out of 122 yielded C. albicans. Todd isolated Candida albicans from about 10% of the mouths and throats of 1000 young adults with no indication of mouth disease. Knighton isolated yeasts (Candida, Cryptococcus and Saccharomyces species) from 32.5% of 123 mouths without dentures, and from 60.9% of 23 cases that were either fully edentulous or with partial plates. However, the incidence of C. albicans was essentially the same in both series, 24.4% for the dentate and 21.7% for the edentulous series. C. albicans was considered to be a constant inhabitant in only a portion of these positive cases. Fisher's, Todd's and Knighton's data are valuable from our point of view for they adequately distinguished C. albicans from probable non-pathogenic yeasts.

Cahn and Bartels present evidence for some denture sore mouths being due to C. albicans and Bartels and Buchbinder have some evidence for this species being involved in infections of root canals. As indicated by Knighton more of such evidence is needed to prove that this organism has anything to do with the production of the condition. Likewise, there is little evidence that Candida is a primary agent in the production of cavities in teeth. Rosebury found "yeastlike organisms" at least 10 times as frequently in mouths containing carious teeth as in those free of cavities. It has been suggested by Fosdick and Hansen that yeasts (including, no doubt, Candida) in their rapid formation of pyruvic acid from sugars accelerate lactic acid fermentation by the lactobacilli and thus indirectly promote caries.

Perlèche is an infection of the commisures of the mouth, a separate clinical entity from thrush. It is said to be fairly common and in 1929 Finnerud was able to report on 100 cases. The experimental disease was wasily produced in human volunteers by pure cultures of Candida and Cryptococcus. Frank, in 1932, found "Monilia" or "Endomyces" in 17% of normal commisures. Isolated strains were used to produce the experimental disease. Most recent writers appear to assume that perlèche is definitely due in many cases to C. albicans, although it is evident that similar pathological conditions are often due to vitamin deficiencies and that perlèche is often, probably usually, an infection towards which such a deficiency predisposes. Benedek and associates have recently intimated that the connection between perlèche and fungi has been disproven. This point of view is not held by all pathologists. The fact that C. albicans is found so frequently in the mouths of individuals with no indication of thrush or other oral disease makes it necessary to make diagnoses from laboratory findings with some caution. Unless the clinical picture is clear and the organisms are found in abundance, the presence of C. albi-

cans in the mouth should have no more significance than the presence of Staphylococcus aureus in an open lesion. Both are pathogens, but both are also normal inhabitants of the body. Although it is evident that thrush and other oral moniliases are communicable it is evident that every case need not originate in another case. The frequent statement that thrush affects largely those whose nutrition is inadequate or unbalanced is based on much circumstantial evidence and can hardly be said to be definitely established as a fact, although it is most probably true.

Bronchomoniliasis was established as a clinical entity by Castellani in 1910. However, as late as 1933, Haler denied that Candida infections of the respiratory tract had been proven. He had frequently found Candida present in such infections, but believed that it might well have been a secondary invader. Experimental work by Poindexter showed that, unlike the pyogenic gram positive cocci, Candida inoculated together with the tubercle bacilli into experimental animals had no effect on the course of the tuberculosis which developed. However, Ikeda studied several cases of bronchopulmonary infections and stated that obscure cases not due to other pathogens were frequently Candida infections and warned other pathologists to keep moniliasis in mind in these difficult cases.

In the past 16 years a number of cases of Candida infections of the respiratory tract have been reported. Granted all these have not been adequately proven to be moniliasis, still when all are considered, it can hardly be maintained that moniliasis of the lungs, the bronchi, and the larynx does not exist. In a recent paper the surprising statement is made "Monilia is not a normal mouth organism". Bakst, Hagard and Foley have a large bibliography of cases previous to 1934.

The problem of making a laboratory diagnosis of moniliasis of the respiratory tract is even more difficult than that of making a diagnosis of oral moniliasis. Everyone who has had any experience in diagnosing pulmonary tuberculosis by a Ziehl-Neelsen stain of sputum must have noted the frequent occurrence of yeast cells, but unless these were isolated and cultured on starvation media, he might not be aware that most of them were Candida species. Moreover as will be shown, they are largely C. albicans. In some cases they may have originated in the mouth, but it is evident that usually they must have been from the lungs or the bronchi. It is evident that they are, in many cases, secondary invaders. For that reason a diagnosis of primary moniliasis of the respiratory tract is to be made only when all other diseases have been ruled out. Mendelson in studying sputums from 100 tuberculous suspects found what was considered evidence that 20 of the patients did not have tuberculosis but moniliasis instead. This is a high incidence but it emphasizes the importance of moniliasis in the tuberculosis clinic. Moniliasis of the mouth, spreading to the larynx, lips, eyes and meninges have also been temporarily misdiagnosed as nonpulmonary tuberculosis and Miale has reported an oral moniliasis which was for some time considered to be tuberculosis.

Jones found 11 of 25 sputums of various respiratory pathological conditions to yield Candida species. Marett found Candidas present in 51.7 per cent of 568 tuberculosis sputums and at anpther time 75 per cent of 2000 sputum samples positive for Candida. Norris and Maher found a much lower incidence of Candida, 8.5 per cent and less than 10 per cent respectively. Fisher and Arnold found in 160 samples of tuberculosis sputum representing 125 cases and 35 duplicate samples, yielded Candida albicans and 23 some other Candida species, but when the attempt was made to isolate the organisms again from 25 positive cases at three weekly or 10-day intervals, 13 were negative each of 3 times, five were positive once out of three, and only seven yielded the organism each time. Obviously the organisms either were not numerous or they were transitory. Schwarting (unpublished M.S. thesis, U. of Minnesota) made a study of 500 tuberculosis sputum specimens and found 99 were positive for

Candida. Sixty-seven isolates were studied further and 58 of these turned out to be C. albicans. Further, she found that there was no evidence whatever that Candida tended to be more prevalent in advanced than in moderately advanced tuberculosis, rather if anything the contrary. Likewise there was no evidence that there was any relationship between cavitation and the presence of Candida. Figures very comparable to the above were obtained by Weedon, Kenny and Shirk who found Candida albicans in 5 out of 55 samples of sputum sent in for diagnosis of tuberculosis. Much higher percentages of C. albicans were found by Burt and Ketchum. Out of sputum samples of 693 tuberculosis sanatorium patients, 250 yielded C. albicans, 40 C.tropicalis, 2 C. Krusei, and 3 undetermined species of Candida.

The differences in the above results may be more apparent than real. It is worthy of note that all who have searched for Candida species in sputum samples have found them. Moreover, those who have distinguished

Monilia vaginitis and vulvo-vaginitis has been reviewed by Plass, Hesseltine and Bortz. As early as 1940, Wilkinson reported the presence of yeastlike organisms in vaginal discharge. By 1875, enough information had accumulated for Hausmann to write a book on the subject. However, gynecologists of the early years of this century either doubted that vaginitis had any connection with fungi, or they believed that mycotic vaginitis was very rare. It is largely due to the researches of Plass, Hesseltine and associates that a new appreciation of Candida as an important cause of vaginitis is again current. Candida is especially likely to occur as a normal parasite in the vaginas of diabetics and infections are more likely to occur among them. Indeed, a common term for the disease has been diabetic vaginitis. The reason for this higher incidence is the recurrent washing of skin or mucous surfaces with glucose-containing urine. With diet or insulin therapy the condition is usually cured or ameliorated immediately after the disappearance of the glycosuria. The disease is much less common in the pre-adolescent and post-menopause years. Experimental vulvitis has been reproduced by Hesseltine and Campbell by applying glucose in powder or solution to normal vaginal surfaces which, however, harbored Candida. If yeasts were absent, however, symptoms were not produced. It is evident that it is not the glucose, acetone bodies or other constituents of diabetic urine which causes the symptoms, rather it is the glucose which favors the development of the causative organism already there.

Candida is more likely to occur in the vaginas of pregnant, than of non-pregnant women, and this is especially true of the last three months of pregnancy. The increase in the glycogen in the vaginal mucosa is the probable explanation. Relief of symptoms or spontaneous cure is usualy after delivery. The incidence of yeasts in the vaginas of pregnant women is high. Woodruff and Hesseltine found 28% of 302 cases from all economic classes during the third trimester of pregnancy. Of these positive cases, nearly half had symptoms of vaginitis. These figures include all yeasts and yeastlike fungi and were obtained by examination of smear slides. In another series of 152 non-indigent patients, 5.3% had positive slides and symptoms of vaginitis and 9.2% positive slides and no symptoms. Carter and associates found 43% of 200 pregnant women to harbor yeasts or Candida in their vaginas.

Unfortunately, these extensive data do not distinguish the pathogenic C. albicans from other yeasts, nor do the earlier results of Woodruff and Hesseltine, who obtained essentially the same results. Negroni found 8% of 100 non-pregnant as opposed to 33% of pregnant women harbored C. albicans in their vaginas. Negroni believed that the habitual use of various antiseptics or basic washes by 50% of his non-pregnant series is responsible for the decreased frequency in the non-pregnant series. This is probably partly responsible but it can hardly be the only explanation. Even if all 8 cultures were obtained from the 50 women who did not admit using these washes, the incidence would

still be 16% among the non-pregnant women, an appreciably lower incidence than the 33% among pregnant women. Thus Negroni's figures become almost exactly like those of Plass, Hesseltine and Borts, who found 32.6% of 46 pregnant women and 15.4% of 39 non-pregnant women all without symptoms of vaginitis, harbored yeasts in the vagina. These last workers did not distinguish species. Considerably lower, but showing the same tendency are Fisher and Arnold's figures. They found 15% of 73 women in a prenatal clinin and 6% of 195 women in a gynecological clinic, had C. albicans in the vagina. In contrast to all these, Castellani and Taylor did not find any Candida in vaginas unless there was a clinical disease.

The presence of C. albicans in vaginas, especially those with vulvitis, is an important source of infection for the newborn. In 1876 Hausman demonstrated cells of Candida n the mouths of newborn from mothers with vaginal moniliasis. Many obstetricians and gynecologists have suggested this as an important source of thrush. A paper of Guilini in 1891 was followed by others up to about 1930, when Hesseltine made his more complete study.

Hesseltine and associates, confirmed by Bland and associates, found that the Candida albicans isolated from the vaginas of pregnant women will cause clinical thrush when inoculated into the mouths of infants. This disease was then promptly cured by the medication used for thrush. Candida Krusei gave entirely negative results but 2 out of 12 babies came down with thrush inoculated with isolates of unclassified Candidas. Since the great morphologic variability of C. albicans was not appreciated when this work was done, these two species may well have also been C. albicans. It is believed that the mother is an important source of infantile thrush and it has been estimated that the child has 35 times the chance of getting thrush if his mother harbors Candida. The incidence of thrush in the Chicago Lying-in Hospital (private) was about 1%. Anderson, Sage and Spaulding recommend that babies whose mothers harbor Candida be temporarily separated from the mothers. It has also been recommended that pregnant women should be examined for Candida albicans in the ante partum period and if found to be present, the women should be treated to eliminate them before the child is born. Vayssière, and Ludlow and Henderson found no connection between vaginal moniliasis of the mother and infantile thrush. Another infection of Candida originating from the vagina has been described, but is very rare, namely, infection of the penis of husbands of women with vaginal moniliasis. Piscane and Copollino have reviewed reported cases of mycotic urethritis of the male up to 1938.

The work of Jones and Martin on the distribution of species of Candida in the vagina has not been mentioned in the above discussion. They found yeastlike fungi in the vaginas of 32% of their series of pregnant and 14% of their non-pregnant women. They also found C. albicans in the vaginas of women who had clinical vaginitis but not of women without symptoms. In these normal vaginas, however, they found the closely related non-pathogenic C. albicans var. stellatoidea (Monilia stellatoidea). Most workers do not distinguish the species from the variety. There seems to be a tendency to ignore this work but the writer knows of no failure to confirm it. If the work cannot be confirmed, this should be put on record. If their findings are confirmed, however, the above discussions on vaginal moniliasis and the occurrence of C. albicans in the normal vagina take on a new meaning of considerably lessened import. The ordinary methods of diagnosing C. albicans, such as chlamydospore formation and sugar reactions that have been used to diagnose C. albicans, do not distinguish the variety from the species. Until it is definitely shown that Jones and Martin were in error in their observation and as far as the author knows, there is no reason to believe that they were in error, the strong probability remains that C. albicans is not a part of the normal flora of the vagina. The source of the pathogen for vaginal moniliasis then, as implied by Mackinnon can best be explained by fecal material which defin-

itely contains C. albicans.

Cutaneous moniliasis has been the subject of an enormous number of papers in the past 20 years. Many of them are of little microbiological interest, rather they belong to the field of dermatology or pharmacology. We shall take space to review only a few of the papers which we cite.

The problem of cutaneous moniliasis in some ways differs from that of the oral, vaginal or bronchopulmonary types of the disease. In the first place Candida albicans is not found ordinarily on the healthy skin although other species of the genus are frequently encountered. Benham and Hopkins, Mackinnon, and Croft and Black conspicuously failed to find C. albicans on the healthy skin. Downing and associates state that they also failed to find this organism on normal skin. Conant and associates imply that C. albicans is found on the healthy skin but they cite no evidence. Very recently Drake isolated a number of cultures from between the toes of a number of individuals, and accurately diagnosed them as C. albicans. In a personal communication Drake states that in some cases intertrigo had been diagnosed but in other cases no certain diagnosis had been made.

Secondly, in many cases of intertrigo, and of onychia or paronychia the dermatophytes are more often the causative agents, and it is possible that other genera of fungi may cause similar diseases, for instance Cryptococcus (a number of investigators), Aspergillus and Scopulariopsis (Negroni) and Geotrichum (Cochet). As Block has stated the problem of proving cutaneous moniliasis is very like that of proving staphylococcic infections. Both organisms are normally present and they can well be and probably often are mere secondary invaders or chance contaminants in the infections. This is probably not so with Candida albicans since this organism is not normally present on the skin. Muende believes that Candida in skin infections is a secondary invader and that this yeast gives rise to symptoms due to allergy. Mackinnon has stressed the importance of being conservative in attributing this or that organism as the causative agent of a skin infection.

Moniliasis of the smooth skin in the moist areas (intertrigo) is not often a serious disease, but it may be somewhat painful and very annoying. In one form , Australian surfer's itch, apparently similar to our athlete's foot, it is malodorous. Cutaneous moniliasis especially intertrigo is more likely to occur among diabetics and obese individuals due to the increased blood sugar and moist surfaces. It has been found that the sweat of individuals with cutaneous moniliasis contains more than the normal amount of sugar. It is common knowledge that individuals whose hands are continually wet, as housewives, bartenders, poultry butchers, etc. are more likely to get skin infections on the hands than other individuals. This has been established notably by Hopkins and Benham who incidentally were able to reproduce the disease by inoculation of human volunteers by pure cultures. In cases of tinea pedis or other intertrigous infections it is often possible to distinguish infections due to Candida from those due to the usual Trichophyton or Epidermophyton by the moistness and redness. Cultivation of the organism, however, is the safest way to actually prove the causative agent.

Onychia and paronchia are due to C. albicans as well as to the dermatophytes and possibly to other species of Candida and other fungi. These diseases, sometimes lumped together as onychia, have had considerable study in recent years, especially in Argentina. Veritable outbreaks among workers in canneries and in the fruit industry in western United States have been shown to be due to a species of Candida, probably C. albicans.

A skin disease, psoriasis, has been connected with Candida: Some years ago it was stated that yeasts and yeastlike fungi were much more numerous in the feces of individuals with psoriasis than in normals, and that these organisms were isolated from the blood stream of a few of them. These observations have not been confirmed and few dermatologists nowadays would connect in any

way psoriasis and Candida. Lowenthal gave a review of all cases in the literature of skin infections in the negro, due to fungi. The review is good but the nomenclature of the organism is confused.

Species of Candida have repeatedly been found in fecal material and they have been accused of being the causative agents of several intestinal conditions but as yet they have not been proven definitely to be the cause of any of these. Negroni and Fischer give a historical survey up to 1933. Langenback, as early as 1893, found yeasts and yeastlike fungi in feces and suggested the connection of these to disease. Casagrandi in 1898 concluded, after considerable work, that yeasts had no connection with diarrhea. It was in connection with tropical sprue that yeasts and yeastlike fungi have been most extensively studied. Kohlbrugge, as early as 1901, found these organisms in the gastrointestinal tract of well and diseased individuals but much more abundantly in patients suffering from sprue.

Ashford found Monilia psilosis in considerable number in cases of tropical sprue. This organism was believed to be a separate species on the basis of Castellani's methods but later it has come to be generally agreed that it is identical with Candida albicans. Ashford studied a very large number of individuals. In one series he found "M.psilosis" in the stools of 55.3% of 280 sprue patients, in 6.6% of 288 patients with nutritional deficiency. 4.7% of 126 other patients and 5.6% of 178 healthy controls. In his series of 178 healthy boys, 10 had C. albicans in their feces, 18 other species of Candida, 51 other fungi than Candida and 99 no fungi at all. Ashford's earlier conclusion that sprue is due to C. albicans (Monilia psilosis) was later modified to the point of view that sprue is a nutritional unbalance on which is superimposed a Candida infection. To support either of these views one can also cite Ashford's experiments in which he produced a stomatitis and diarrhea by feeding cultures and Woods production of hemolytic anemia in guinea pigs by feeding cultures of the organisms. Anderson also found yeastlike fungi, mostly "wild yeasts" apparently Crytococcus but also apparently some Candidas in the human intestinal tract, very many more in sprue cases than in patients with other gastrointestinal disorders or in healthy individuals. Negative results were obtained by feeding these yeasts. Skin tests have been used to indicate that sprue is directly or indirectly a Candida infection. Fischer and Arnold found C. albicans in 34% of 69 pathological gastric contents and in 18% of 17 normals. Swartz and Jankelson found the presence of C. albicans in stools of non-specific ulcerative colitis a prognostic sign denoting a malignant course and a possible fatal termination of the disease. The organism was accurately diagnosed by the chlamydospores, Kesten and Suarez found some immunological difference between the Monilia psilosis of sprue and the M. albicans of intertrigo.

Many recent workers have found no evidence that sprue is in any way connected with yeasts or yeastlike fungi. Mackie and Chitre for instance found approximately the same percentage of persons positive for Candida albicans in sprue and non-sprue cases.

It is remarkable that investigators from different continents, working with largely rural or entirely urban, and with indigent or well-to-do persons, have all found about the same incidence of C. albicans in the feces. Benham and Hopkins, 18% of 100 normals, Schnoor 16.9% of 314 normals, Negroni and Fischer, 14% of 50 surgery cases; Lawler and associates, 14.7% of 102 normals; Nye and associates 15% of 192 fecal samples and 31 gastric contents (normal), Fesenfeld, 19% of 300 new admissions in hospital. Only Fischer and Arnold got markedly different figures, 5% of 39 college students.

We must conclude that C. albicans is a normal parasite in the human intestinal tract, being found in about 15% of normal individuals. The evidence for a connection between intestinal disease and Candida is not conclusive

and is counterbalanced by considerable negative evidence. It has been suggested that the intestinal tract is the greater reservoir of C. albicans, and this may well explain the origin of the infection in other parts of the body. Castellani has the opposite point of view. He attributes the greater incidence of pruritis ani among females than among males to the organisms which are so frequently found in the vagina.

Moniliasis is to be considered a "superficial mycosis". The organism seems to have an affinity for the mucous membrane and moist skin surfaces and most infections are confined to these superficial areas. In onychia and paronychia and in bronchial moniliasis, th. infections are somewhat deeper. Rarely are the cases fatal. Six cases of monilial endocarditis have been shown to be caused by species of Candida. There are three cases of monilia meningitis on record in which Candida was apparently the causative agent, one of these certainly, another probably and the third possibly C. albicans. A species of Candida was possibly the causative agent in a case of osteomyelitis. Besides those just mentioned, six clinical reports of cases have been found in which there was more or less of a generalization of the infection. There are probably other papers in the literature. It is very probable that some of these supposed generalizations of moniliasis were id reactions. It is evident that Candida does not tend to generalize or to be carried by the blood stream, to secondary foci of infection. Such infectinns occur but they are rare.

Little is known as to the distribution of Candida in animals. It has been recorded in laboratory animals, rats, hens, rabbits, pigeons and the European hedgehog. As a pathogenic organism of turkeys and chickens, C. albicans is known to cause considerable loss. The infection is a thrush-like one and involves the mouth, crop, proventriculus and gizzard. In young birds the infection is often fatal, in older ones recovery is usual. As to infections of domestic mammals, the writer has found no original data. Perhaps a quotation from Hogan's work of 1943 is appropriate: "Some authors refer to monilia infections of the oral mucosa in calves and colts. No additional information about them is available. Presumably they are of little consequence."

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In the interests of conservation of space, only important monographs and papers with extensive literature reviews are cited. A paper in press in Bacteriological Reviews "Yeastlike fungi: Candida and Brettanomyces" with over 300 references to literature published since 1930 will include references to the authors cited above.

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IV. GOSSIP

The following article appeared in Newsweek February 17, 1947, pages 57-58: FREEDOM TO HEAL, "In the spring of 1946, the University of Minnesota School of Medicine offered a short course in practical psychiatry to a group of general practitioners. To determine the individual value of this training, a questionnaire was sent to each student six months after the course was completed. Last week in the annual report of the Commonwealth Fund, which sponsored the Minnesota study, Barry C. Smith, general director of the fund, described the doctors' enthusiastic response. None had become a really skillful psychotherapist in this brief period; all had worked near the surface of the patient's emotional problem. But all agreed that 'the results of thoughtful and unhurried study of patients who needed to ventilate their anxieties were rewarding'. One doctor had seen a ten-year-old case of eczema improve in a minister who thought himself a failure. Another, by a deft hint to the mother of a girl in danger of death from anorexia (loss of appetite) helped to lift the burden of guilt which the child had been carrying, and so to reverse the course of her illness. Most of the doctors said that, because of the course, they were 'happier in practice'. They were helping some patients who had previously baffled them; they were thinking straight about those whom they could not help. They had stopped blaming patients for neurotic behavior and themselves for failing, after due effort, to find organic causes for the sick person's symptoms. 'This increment of freedom in the relationship with their patients was enough in itself to make them better doctors,' the Commonwealth report concluded. 'Perhaps this is the irreducible minimum of what psychiatry has to teach medical men; if so, it is still a precious gain.'"....Walter L. Frank, M.D., announces the reopening of his office for the practice of ophthalmology at 313 Medical Arts Building, Minneapolis....
On Monday, February 17 I attended the public meeting of the House Committee on Dairy Products and Livestock to consider an act relating to pasteurization of milk, cream, or fluid milk products. Purpose of the law is to compel all milk sellers to pasteurize cream and fluid milk. Because of the difficulty in getting equipment, the act would not become effective until July 1, 1948. Other legislation will cover all butter, cheese, and skim milk products sold. A group of us spoke for the bill, Wesley W. Spink, Dean S. Fleming, Willes B. Combs, H. Macy, Herbert M. Bosch, and members of the dairy organization; against the bill were operators of raw milk creameries, their attorney, and various lay persons who believed in the superior merits of raw milk. To change over their plants most dealers would have to install a heat treatment unit, as they have the rest of the equipment at the present time. Minnesota is losing business because of the embargo on our products which are not pasteurized, but apparently the cost of producing pasteurized milk is one of the items which is a stumbling block. The raw milk crowd are essentially an anti-medical group, although a few doctors endorse their product. Before the meeting was very old the opinions of Doctors Brady and O'Brien were brought into the controversy, I was amazed to learn that one hospital actually bought raw milk although they may have used it for cooking purposes and not as a beverage. We learned that raw milk was much better for humans than pasteurized milk and that it actually possessed medicinal value. It is discouraging to find resistance to heat treatment of milk, but one could see that the raw milk dealers who had been selling their product as "superior" all these years would be forced to compete with grade A pasteurized milk on its own merits. Hearing was continued for a week to consider more evidence. It will take a long time for everyone to accept the contributions of public health, but until they do, there will be a great deal of unnecessary illness. The public health authorities must not relax their controls as failure to properly pasteurize milk has resulted in major outbreaks of infection, notably typhoid fever. I am told that a home pasteurizing unit will soon be on the market to be made by the same concern which makes machines for toasting bread. Estimated price, $25. A bell will ring when the batch has had the proper heat exposure and the house-

wife then can plug the can in cooling fluid. Two arguments used against pasteurized milk are: (1) that heat treatment interferes with nutrition, and (2) that it alters taste. The United States Public Health Service conducted an intensive study of 3,700 children to determine whether those who drank heated milk actually throve less well than those who drank raw milk. The results of the studies showed that the average weight of the children receiving raw milk was 33.2 pounds, whereas the average weight of the children receiving heated milk was 33.6 pounds; also the average height of the children receiving raw milk was 37.4 inches, whereas the average height of children receiving heated milk was 37.5. Furthermore, from the parents' reports it was found that the children who drank raw milk suffered with communicable diseases more frequently than did the children who drank heated milk only. The final conclusion of the study was that, taking into account the average supplementary American child diet, children who are fed pasteurized or other heated milk thrive as well as children who are fed raw milk, and contract certain communicable diseases less frequently. To answer the objection to the taste of pasteurized milk, the United States Public Health Service has staged demonstrations in which one batch of milk is divided into two portions (raw and pasteurized). Cups are filled from each sample and passed out as unknowns. It is fundamentally important that raw and pasteurized milk be the same milk except for pasteurization. Except for chance, participants have failed in every instance to detect which milk was raw and which was pasteurized. When grade A raw milk is subjected to proper heat treatment, and care in the home, it is the only milk which should be used for beverage purposes. It is surprising how otherwise intelligent persons accept any milk which is offered to them without question. Minnesota law already requires milk for animal feed to be pasteurized before it can be sold.... The Continuation Course in Ophthalmology at the Center opened Monday, Feb. 17 and will close Friday, Feb. 21. Guest faculty include William L. Benedict, Professor of Ophthalmology, Mayo Foundation, Harold F. Falls, Assistant Professor of Ophthalmology, University of Michigan, Lawrence T. Post, Professor of Clinical Ophthalmology and Head of Department, Washington University, St. Louis, and Alan C. Woods, Professor of Ophthalmology and Ophthalmologist in Chief, Johns Hopkins University, Baltimore. Harold L. Falls is making a brilliant contribution to the program. This young geneticist who decided to study medicine and major in ophthalmology, gives a fascinating account of orbital heredity. He also is an excellent ophthalmologist and has a sparkling personality. Doctors Post, Woods, and Benedict add great weight to the brilliant faculty which has been assembled by Erling W. Hansen, Clinical Professor and Director, Division of Ophthalmology. The Ophthalmology group have the Center program this year, the Otolaryngology will follow next year.... The Minnesota State Medical Association and the Minnesota Cancer Society are planning a series of regional cancer meetings, the first to be held in Worthington, Minnesota, Tuesday, March 25. A team of 4 physicians and 4 lay leaders will invade Worthington on this date to further the cause of cancer control in the counties of Pipestone, Rock, Murray, Nobles, Cottonwood, Jackson, Watonwan, Martin, and Faribault. Physicians from this area will be invited to attend clinics, hear talks and participate in conferences. Laymen will hear organization leaders and see movies in the morning, and hear talks by the physicians in the afternoon. The lay meeting will close at 4 p.m.; the physicians at 9 p.m. This is a demonstration project which we hope eventually will cover the entire state. These meetings will be financed by the Minnesota Department of Health and the Minnesota Cancer Society. This week physicians in Minnesota received a complementary copy of the Minnesota Cancer Bulletin from the same organizations. Originally published in Illinois, the first 13 numbers were purchased for Minnesota distribution. Zelda Ball who received her graduate training at Minnesota, assisted in assembling the original material. Dr. Ivy was also one of the contributors. The bulletin contains striking illustrations, many in color and definite statements concerning the various forms of malignancy.....