Y E A S T S

A News Letter for Persons Interested in Yeast

February 1954 Volume III, Number I

Editor for 1953, 1954
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The Editor takes pleasure in thanking all those who have contributed to this issue. Without this gratifying support the News Letter cannot fulfill its purpose. The Editors would like to invite others to send in contributions for future issues. It is planned to publish the next issue of the News Letter in September 1954. It would be appreciated if anyone would notify the Editor of Additional people in our field who would like to receive the Yeast News Letter.

Cost of operation. Contributions to help finance the News Letter are voluntary. Present funds on hand are very meager. It would be most helpful if each of those sufficiently interested would contribute a quarter. Many thanks to those who have recently contributed.

The Editors

I. Note from Dr. W. H. Peterson, Biochemistry Department, University of Wisconsin, Madison, Wisconsin.

J. S. Chiao and W. H. Peterson recently published the folowing paper "Yeasts, methionine and cystine contents", Agricultural and Food Chemistry 1, 1005 (1953).

Dr. Chiao is now in the Research Department of the Grain Processing Co., Muscatine, Iowa. Mr. Teophilo Herrera, a Point Four man from Mexico, has joined our laboratory to work on the amino acids of active dry bakers yeast.

II. U. S. Department of Agriculture, Food Fermentation Laboratory, North Carolina State College, Raleigh, North Carolina.

John L. Etchells has sent the following information.

Our cooperative investigations with the North Carolina Agricultural Experiment Station have resulted in completion of the following studies.

1. Morphology and Pigmentation of Certain Yeasts from Brines and the Cucumber Plant; by Etchells, Bell, and Jones. FARLOWIA, 4, 265-304. 1953. (Illus., 15 color plates, 109 black and white plates.)

2. Procedure for Determining Carotenoid Pigments in Yeasts; by Peterson, Bell, Etchells, and Smart. JOUR. BACT., 1954. (Accepted for publication.)

3. Microbiological and Chemical Changes During the Fermentation of Sweet potato Silage; by Hall, Etchells, Jones, and Lewis. (For persentation at Soc. Amer. Bact. Meeting, Pittsburgh, Pa., May 2-6, 1954.)

4. Controlling Molds During the Enumeration and Isolation of Yeasts from Soil and Plant Material; by Costilow, Etchells, and Demain. (For presentation at Soc. Amer. Bact. Meeting, Pittsburgh, Pa., May 2-6, 1954.)

5. Yeasts from Commercial Meat Brines; by Costilow, Etchells, and Blumer. (Submitted for approval for publication.)

Single copies of article No. 1 above (Morphology and Pigmentation of Certain Yeasts ...) are available to students, teachers, and research workers as long as the supply lasts. Address your request to: Box 5578, Raleigh, North Carolina.

III. News from Michigan State College, East Lansing, Michigan.

Communicated by Dr. Ralph W. Costilow.

Some of our readers may have heard already that Dr. F. W. Fabian retired last July 1. Teaching and research in the microbiology of foods and fermentations has been taken over by Dr. Ralph W. Costilow, who formerly studied with Dr. John L. Etchells of North Carolina State College.

The Editors wish to express their gratitude to Dr. Fabian for the numerous contributions from his laboratory to the field of food microbiology. We hope that, as Professor Emeritus, Dr. Fabian will continue to take an active interest in the field, which he has served for so many years. Two of his former graduate students are well known for their outstanding contributions to the field of yeasts. These two scientists are Dr. L. J. Wickerham and Dr. John L. Etchells.

Two publications from this department concerning yeasts have appeared recently:

1. R. N. Costilow and F. W. Fabian. Microbiological studies of cucumber fermentations. Applied Microbiology, 1, No. 6, 314-319. 1953.

2. R. N. Costilow and F. W. Fabian. Effect of various microorganisms on the vitamin and amino acid content of cucumber brines. Applied Microbiology, 1: No. 6, 327-329. 1953.

IV. Biological Research Laboratory, Southern Illinois University, Carbondale, Illinois. Director Dr. Carl C. Lindegren.

Various aspects of yeast biology are under investigation in this laboratory at the hands of the following workers.

A. Yeast Genetics - Mrs. Lindegren, Mrs. Peng.
B. Biochemical Genetics - Dr. Ogur and Ralph St. John.
C. Yeast Cytology - Dr. McClary and Marian Williams.
D. Adaptation in Yeasts - Dr. Lindegren and David Pittman.
E. Radiobiology - Alvin Saracheck, David D. Pittman, Paul Pedigo and Ernest Shult.

In Addition to the above, the staff of the laboratory includes a full-time statistician, a full-time secretary, a part-time draftsman and non-technical help.

Several half-time research assistantships will be available next fall in the Biological Research Laboratory. The program of the laboratory has emphasized not only genetic and cytological, but also biochemical, radiobiological, and immunological investigations of the yeasts. The Carbondale collection, consisting of more than 20,000 inbred strains bearing 23 genetic markers, offers research opportunities not generally available. These studies have been supported by the University with the help of grants from Anheuser-Busch, Inc., United States Public Health Service, Atomic Energy Commission, Office of Naval Research, and American Cancer Society.

In the Spring of 1954, the Department will move into the New Life Science Building, erected at a cost of $1,500,000. The laboratory is presently equipped for work involving micromanipulation and microdissection, ultraviolet and X-radiation, radioactive isotopes, respirometery, spectorphotometery, automatic fraction collection and high speed centrifugation, and photomicrography. It is staffed by three principal investigators, Dr. Carl C. Lindegren, Dr. Maurice Ogur, and Dr. Dan O. McClary, several full-time research associates and assistants.

The present instructional program leads to the M. A. degree and offers work in: (a) Genetics of Microorganisms, (b) Cytology of

Microorganisms, (c) Biochemistry and Physiology of Microorganisms, (d) Microbiology of Foods, (e) Industrial Fermentation, (f) Techniques of Microbiological Research, (g) Seminar and (h) Thesis. Excellent collateral programs are available in Botany, Chemistry, Mathematics, Physics, Physiology, and Zoology.

Assistants will receive stipends of $150 per month and tuition scholarships. They will be expected to donate eight hours per week in service to the department. Summer employment in the laboratory usually is available.

Interested students may address their applications to Professor Carl C. Lindegren, indicating their general aims. A record transcript and two supporting letters from professors will be expected.

A. Yeast Genetics.

The following papers have been published or accepted for publication:

1. Proximity of genes controlling the fermentation of similar carbohydrates in Saccharomyces by Carl C. Lindegren and Gertrude Lindegren. Nature 170, 965 (1952).

2. The genetics of melezitose fermentation in Saccharomyces by Carl C. Lindegren and Gertrude Lindegren.

3. Heterosis in Saccharomyces by Carl C. Lindegren, J. Edgar Braham and Juan de Dios Calle.

4. Gene conversion in Saccharomyces by Carl C. Lindegren. Jour. Genetics 51, 625 (1953).

5. Asci in Saccharomyces with more than four spores by Carl C. Lindegren and Gertrude Lindegren. Genetics 38, 73 (1953).

Genetical analysis of various hybrids showed that the four different genes controlling the hydrolysis of alpha-glucosidic saccharides maltose, turanose, alpha-methyl glucoside, sucrose, melezitose and raffinose are all on one chromosome. This finding led to the conclusion that the four genes probably evolved from a single locus (presumably that which produces the specific maltase) by unequal crossing-over followed by mutation of the "extra" gene.[1]

The interactions of the two genes controlling the production of a specific maltase and a specific alpha-methyl glucosidase led to the conclusion that the gene controlling the adaptive production of alpha-methyl glucosidase may be involved in the synthesis of maltase, since it appeared to act in concert with the maltase gene to increase the amount of maltase produced in hybrids. The data suggest that similar enhancing genes may supply the basis for hybrid vigor.[3]

The analysis of over 28 families involving hybrids heterozygous for the genes controlling the fermentation of maltose and alpha-methyl glucoside led to the conclusion that direct tetrad analysis does not confirm the prediction of Mendelian theory that every heterozygous spore mother cell will produce two dominant and two recessive segregants. The data indicate that interaction between the two alleles may occur and that a dominant gene may be converted into a recessive and vice versa.[4]

It has been proposed by Winge and Roberts that irregular segregations in yeasts may appear to have occurred if supernumerary mitoses occur in the ascus followed by the disintegration of some of the spores. Under these conditions a four-spored ascus might give the false impression of a non Mendelian segregation. The analysis of asci with more than four spores revealed that supernumerary mitoses do not occur in the ascus.[5]

B. Biochemical Genetics.

The following papers have been published or accepted for publication:

1. Desoxyribonucleic acid and the budding cycle in the yeasts by Maurice Ogur, Sherwood Hinckler and Dan Mc Clary.

2. Amide synthesis and transamidation during growth of Saccharomyces cerevisiae by A. Leonard Sheffner and John Gradow. Jour. Bact. 66, 192 (1953).

Analysis of the desoxyribonucleic acid in cells during the budding cycle revealed that at the time of the first appearance of the bud, the yeast cell contains double the amount of DNA present in the unbudded cell.[1]

Transamidation was found to occur during growth of yeast.[2]

C. Yeast Cytology.

The following papers have been published or accepted for publication.

1. Structures in the yeast cell revealed in wet mounts by G. F. Townsend and Carl C. Lindegren. Cytologia 18, 183 (1953).

2. Methods for distinguishing the centrosome, the centrochromatin and the chromosomes of the yeast cell by Carl C. Lindegren and G. Fred Townsend.

3. Characteristic growth patterns of the different members of a polyploid series of Saccharomyces by G. Fred Townsend and Carl C. Lindegren.

4. Stability of hybrids in Saccharomyces by Carl C. Lindegren and Gertrude Lindegren.

5. The control of nuclear and cytoplasmic synthesis by the nucleo-cytoplasmic ratio in Saccharomyces by Carl C. Lindegren and Samir A. Haddad.

6. Growth rates of individual yeast cells by Carl C. Lindegren and Samir A. Haddad.

Most of the structures which have been described in the yeast cells by various staining techniques followed by mounting in balsam can be made visible in wet mounts of cells without the extensive shrinkage which occurs in mounting. This observation is of considerable importance, since it indicates that these structures are not artifacts.[1]

New methods were found for distinguishing the centrosome, centrochromatin and chromosomes.[2]

In the genetics of higher organisms it is possible to determine the ploidy of parents and offspring by chromosome counts but this procedure is not feasible with microorganisms. It is therefore, of extreme importance that specific methods of ploidy determination be available in the genetical analysis of any microorganism in order to validate the genetical procedure. Much of the work of Dr. Ogur in the laboratory has been aimed at the discovery of biochemical criteria of ploidy. Cytological observations by Mr. Townsend have confirmed the earlier views concerning the relation of cell size and degree of ploidy.[3]

In the production of yeast hybrids, it was originally shown by Fowell in England that heterokaryons may be produced rather than true hybrids and that these often break down without fusing. Further evidence confirming Fowell has been obtained and the importance of this phenomenon in the study of yeast genetics has been emphasized.[4]

When the resting cell with a single nucleus and a full complement of cytoplasm is placed under conditions favorable for growth, sufficient nuclear material is synthesized to produce a second nucleus and the ratio of nucleus to cytoplasm becomes twice its original value. At this point the synthesis of cytoplasm is initiated and progresses until the ratio again reaches that of the resting cell.[5]

The dry weight of the individual yeast cell increases in a linear manner with time until final volume is attained. During budding only cytoplasmic or extra-nuclear material is synthesized, while during the period of constant volume, only nuclear material is synthesized. The fact that the growth rate is constant during cytoplasmic increase shows that the concentration of enzymes controlling growth remains constant in the growing cell. This suggests that the genome acts constantly at a linear rate in the synthesis of the enzymes required for growth.[6]

D. Adaptation in Yeasts.

The following papers have been published or accepted for publication:

1. A single adaptive enzyme in Saccharomyces elicited by several related substrates by Norberto Pallenoni and Carl C. Lindegren. Jour. Bact. 65, 122 (1953).

2. Relationship between the oxidative and fermentative phases during adaptation to galactose in Saccharomyces cerevisiae by A. Leonard Sheffner.

3. Long-term adaptation to the fermentation of galactose in Saccheromyces chevalieri by David D. Pittman and Carl C. Lindegren.

4. Induction in Saccharomyces of the gene mutation controlling utilization of galactose by exposure to galactose by Carl C. Lindegren and David D. Pittman.

The analysis of the adaptive phenomenon in yeast has depended to a considerable extent on direct measurement of the CO_2 evolved but it was found that this method did not provide an accurate measurement of the amount of enzyme produced.[2]

The phenomenon of long-term adaptation of Saccharomyces chevalieri to the fermentation of galactose was analyzed by the study of the appearance of papillae in colonies of the non-fermenter grown on EMB agar. It was found to be predominantly a phenomenon of mutation followed by selection.[3]

An exhaustive analysis of the induction of the gene mutation controlling the utilization of galactose in Saccharomyces revealed that it was a result of exposure of the non-fermenter cell to galactose.[4]

E. Radiobiology.

The following papers have been published or accepted for publication:

1. Ultraviolet inactivation of Saccharomyces during the budding cycle by Alvin Sarachek.

2. Induction in Saccharomyces of resistance to X-ray inactivation by pre-exposure to 2537Å ultraviolet radiation by Alvin Sarachek and W. H. Lucke.

3. A comparative study of the retardation of budding and cellular inactivatio by ultraviolet radiation in polyploid Saccharomyces with special reference to photoreactivation by Alvin Sarachek.

4. The effects of ultraviolet and X-radiation upon the heterochromatin of Saccharomyces by G. F. Townsend, Alvin Sarachek and Carl C. Lindegren.

5. Evidence for two different types of X-ray damage revealed by analysis of retardation of budding in Saccharomyces by Alvin Sarachek, Ernest E. Shult and Carl C. Lindegren.

6. Characteristic alterations of the budding process of Saccharomyces induced by ultraviolet treatment by G. F. Townsend and Alvin Sarachek. Jour. Bact. 65, 747 (1953).

A study was made concerning the relationships between the changes in the susceptibility of cells to inactivation by ultraviolet radiation and the nucleic acid metabolism of cells during the budding cycle (Ogur, Minckler and McClary). The amount of damage sustained by the cell prior to inactivation is determined by the nucleoplasm-cytoplasm ratio, while the number of events participating in inactivation, as well as the rate of inactivation, depend upon the quantity and distribution of desoxyribosenucleic acid within the cell.[1]

The populations of haploid or diploid cells are exposed to high doses of ultraviolet radiation, a portion of the cells which survive exhibit increased resistance to X-ray inactivation. This increased resistance is induced by the ultraviolet radiation. The data indicate that chromosomal aberrations are a significant factor in cellular inactivation by X-rays.[2]

Photoreactivation of ultraviolet inactivated Saccharomyces proceeds in accord with the dose-reduction principal. The proporation of damage repaired per unit of visible is the same for all members of a polyploid series of cells from haploid through tetraploid. The photorecovery from damage effecting the suppression of mitosis does not follow the dose-reduction rule.[3]

Ultraviolet radiation blocks heterochromatinization during yeast cell prophase while X-radiation does not. These observations indicate that desoxyribonucleic acid synthesis and heterochromatinization are not necessarily associated in Saccharomyces.[4]

X-ray retardation of budding in Saccharomyces is described by a diphasic dose-response curve. Each phase is taken to indicate the accumulation of a unique type of damage. Relationships are established between the damages participating in cellular inactivation and the retardation of budding.[5]

Ultraviolet inactivated yeast cells undergo a morphologically aberrant growth pattern prior to death. The characteristic anomalies involve the formation of tubular spatulate buds and a marked delay in the division of chromatin material.[6]

V. Work at Illinois Institute of Technology, Chicago, Illinois.

Submitted by L. R. Hedrick, Biology Department

1. Mr. Clyde Doughty and Mr. William Mattey are continuing their work on yeast agglutination, especially with reference to antigen absorption and the fundamental relation to antibody reactions.

2. Mr. Selwyn Simon is continuing his work on the physiology of yeasts and among other things has, by the use of infrared spectrophotometry, determined that the cell wall of Hansenula anomala gives the pattern of cellulose type II. An abstract of the report is:

INFRARED SPECTROPHOTOMETRY OF HANSENULA ANOMALA

WHOLE YEAST CELLS AND THE YEAST CELLULOSE

"Infrared spectrophotometric patterns were determined for whole yeast cells that had been cultured under a variety of conditions. A regenerated cellulose film from each of these cultures was likewise examined for absorption maxima with a Perkin-Elmer double beam infrared spectrophotometer. The pattern of wood cellulose type I was also determined.

Although the cells were produced under different conditions of aeration (shaking or stationary), different glucose concentrations (1 percent and 5 percent), different nitrogen sources (KNO_3, $(NH_4)_2HPO_4$, peptone and nitrogen depletion by aerating in a nitrogen free medium for 24 hours), all the different samples gave similar patterns for the whole cells. The infrared absorption spectrum for the cellulose fractions of the various yeast cultures likewise were similar to each other. Although the whole cell preparations had absorption maxima of less intensities than those of the cellulose fraction, the principal absorption characteristics of the whole cell was essentially a reflection of the pattern for the cellulose moiety. The yeast

cellulose resembles cellulose type II which differs from bacterial cellulose, type I, by an absence of absorption at 7.4 μ very slight absorption at 7.0 and 7.5 μ and a difinite absorption at 7.3 μ while in type I these wave lengths have maxima of nearly equal intensities. In the 8.5 μ to 10.0 μ band, the absorption at 9.0 and 9.4 and 9.6 μ are absent as distinct entities in cellulose II, but these absorption areas merge to produce a deep and broad pattern with slight maxima at 9.4 and 9.6 μ. Both types have maxima in the 8.6 μ regions."

3. Mr. Frank Minzenberger, Mr. Robert Betz and Dr. Allan H. Roush have been studying enzymes involved in purine metabolism in yeasts. Guanase, adenase and uricase have been found in various yeasts and the adenase has been purified and characterized to some extent.

VI. Communicated by Dr. L. J. Wickerham. United States Department of Agriculture, Agricultural Research Service, Peoria 5, Illinois.

A paper from our Laboratory will be published, presumably soon, in the JOURNAL OF BACTERIOLOGY describing a simple procedure for isolating mating types from diploid species of Hansenula. Sporulated cultures are heated at a temperature and for a period of time which will kill the vegetative cells but not the spores. Then the culture is streaked on plates, 16 to 20 colonies are picked and individually tested for the ability to sporulate. If none or almost none sporulate, the strain is heterothallic. If all sporulate, the strain is homothallic.

The nonsporulating isolates of a heterothallic strain are mixed together by fours on slants of sporulation medium. Those mixtures producing spores contain opposite mating types. The four isolates are then mixed in all combinations of two strains to determine which isolates are of opposite sex.

All of the diploid species producing Saturn-shaped ascospores are homothallic, all producing hat-shaped ascospores, so far as known, are heterothallic.

In Hansenula subpelliculosa, the mating types of strains assimilating cellobiose, melezitose, and soluble starch mate readily and abundantly with mating types of strains that do not assimilate these three compounds. The diploid hybrids of such a union are quite similar in their attack on these carbon sources, but the haploid segregants which they produce show marked variation in their ability to attack the three carbohydrates.

Some of the strongest sporulating strains of Hansenula anomala in our collection are unisexual diploids. A unisexual diploid can be derived from a bisexual diploid by allowing a haploid culture to self-diploidize. Diploid cultures can be isolated from a mixture of diploid and haploid cells by streaking the culture on plates. The diploid cells produce larger colonies.

Hansenula schneggii and Candida pelliculosa are haploid cultures of Hansenula anomala. Most of these haploids attack raffinose and sucrose less strongly than diploid strains of H. anomala. Strains of H. schneggii and C. pelliculosa mate with mating types obtained from typical diploid strains of H. anomala, but these matings are less fruitful than matings between opposite types derived exclusively from diploid

strains. It seems obvious that H. schneggii and C. pelliculosa should be considered as a variety of H. anomala.

Mating types of H. subpelliculosa, H. anomala, and H. ciferrii are available to any who may need them, and so are the diploid strains from which they are obtained, as well as diploid unisexual and bisexual strains of H. anomala and the haploid H. schneggii. Simply by mixing the opposite sexes on a slant of malt extract sporulation medium, incubating at 25°C, and observing every two days, the entire sexual process of conjugation, ascospore formation, and rupture of the mature asci may be readily observed.

The Laboratory had the very pleasant experience of a month long visit from Dr. Emil Mrak while he was on sabbatical leave. Views on taxonomy, ecology, sexuality, and hybridization were exchanged, and Dr. Mrak presented two interesting talks to the staff of the Laboratory.

VII. University of Southern California, Department of Bacteriology, Los Angeles 7, California.

Communicated by Dr. M. D. Appleman.

The project carried on by the Department on the effect of chemotherapeutic agents on brewery yeast and bacterial contaminants is almost complete and will be presented in one of the meetings in the near future. Mr. Robert Levin is working on sectioning of yeasts for electron microscopy studies.

VIII State College of Washington, Pullman, Washington, Department of Bacteriology and Public Health.

Communicated by Dr. C. E. Skinner.

We are still working on the yeasts found on the normal skin. Dr. George Connell has finished his part and it has appeared as the following publication: "The external surface of the human body as a habitat for nonfermenting nonpigmented yeasts" by G. H. Connell and C. E. Skinner. J. Bact. 66, 627 (1953). Dr. Connell is now at the Pine Ridge Arsenal, Pine Ridge, Arkansas. Dr. Robert Hurd is preparing, for publication, his work on the fermenting yeasts found on the skin. He is now in the Biology Department, Gonzaga University, Spokane, Washington. Currently Miss Joan Huxley and I are working on the species of of Rhodotorula found on the skin. I am also preparing a "continuation review" of Candida and Brettanomyces for Bacteriological Reviews and should appreciate reprints of any paper that so much as mentions these genera. The review will not be out for a few years but a bibliographical study of this sort takes time so I have collected some 400 articles most of which I have read but some of which I shall have to wait for until I can get to a library where they can be found. Elimination of titles can come after collection of them. Any help I can get, particularly in the form of current articles, will be most welcome.

IX. Instituto de Hingiene, Facultad de Medicina. Av. A. Ricaldoni 3051, Montevideo, Uruguay.

Communicated by Dr. Ricardo C. Artagaveytia-Allende.

We are now working on filamentous forms and on the isolation of nonpigmented strains of certain species in the genus Rhodotorula.

Routinely we are studying the yeasts of the mouth and faeces of human subjects, which have been subjected to antibiotic therapy.

A publication about the finding of Torulopsis pintolopesii in mice is in press. (Arch. Soc. Biologia de Montevidea 20 (1953).

Last October, Dr. Dante Borelli from the Caracass School of Medicine, joined the staff to study certain mycological problems. Among others, the experimental pathology of several strains of Cryptococcus is being investigated.

X. Departamenta de Biologia Geral, Fac. de Filosofia, Ciências e Letras, Universidade de S. Paulo, Caixa Postal 8105 São Paulo-Brasil.

Communicated by Dr. A.Brito da Cunha.

1. Thanks to the cooperation of The Rockefeller Foundation, Conselho Nacional de Pesquisas do Brasil and the University of São Paulo, Dr. El-Tabey Shehata is here in the laboratory since January 10 and will stay for at least one year. He came to work with the other members of the laboratory staff on the project of ecological relations between Drosophila and yeasts.

2. A paper by Professor Theodosius Dobzhansky (Columbia University) and A. Brito da Cunha is now in press in Ecology. The title of the paper is "Differentiation of nutritional preferences in Brazilian species of Drosophila". The summary of this paper is given below:

"Experiments on food preferences of species of Drosophila have been made in four different regions of Brasil: in the equatorial rainforests near Belem and on the lower Tapajos, in the State of Pará; on the upper Rio Doce in the State of Minas Geraes; and near the city of São Paulo in Southern Brazil. The flies were attracted to the bait consisting of autoclaved banana fermented with one or the other of the four strains of yeast belonging to the species Candida krusei (3 strains) or Kloeckera apiculata. (One strain)

At least half of the species of Drosophila which were collected in sufficient numbers showed clear preferences for a single yeast strain. Some Drosophila species showed racial variations in food preferences. No species, however, proved rigidly specialized for only one yeast. Some species of Drosophila are able to distinguish between strains of yeasts which seem to be identical in standard tests used in yeast systematics."

3. A. Brito da Cunha and Elisa P. Knapp have begun the classification of about 325 strains of yeast isolated from severalspecies of Drosophila collected in nature. This classification is now being continued by Dr. El-Tabey Shehata. Shortly, many more strains will be isolated and experiments on differential attraction of Drosophila, competition between Drosophila species with different yeasts as food and adaptive value of chromosomal inversions with different yeasts as nutrients will be started.

4. Elisa P. Knapp has gone to the Department of Food Technology of the University of California In Davis, to study yeasts under E. M. Mrak and H. J. Phaff. Mrs. Knapp has a Rockefeller Foundation Fellowship and expects to remain in the United States for about one year.

XI. Dr. H. W. Schoenlein of Difco Laboratories, Detroit, Michigan, has summarized a number of dehydrated media which may be useful or of interest to mycologists.

Bacto-Chlamydospore Agar is recommended for the differentiation of Candida albicans from other species of Candida on the basis of chlamydospore formation. Chlamydospore formation is encouraged on this medium which is prepared according to the formula described by Nickerson and Mankowski, J. Infect. Diseases, 92; 20 (1953).

Bacto-Orange Serum Agar provides the mycologist with a new medium for the cultivation and isolation of yeast, lactobacilli and other aciduric microorganisms. This medium has been used for a number of years in the detection of microcrganisms associated with spoilage of citrus products by Hays, Troy and others.

The nutrient medium and differential medium as described by Green and Gray, Wallerstein Lab. Comm., 13; 357 (1950), have been of value in the sanitary control of brewing and industrial fermentation processes. The nutrient medium permits the development of yeast and bacteria, while the differential medium permits unrestricted growth of bacteria, with the inhibition of yeasts and molds. These media are supplied in dehydrated from as Bacto-WL Nutrient Medium and Bacto-WL Differential Medium. Bacto-Rogosa SL Agar and Bacto-Rogosa SL Broth are two selective media for growth of lactobacilli. These are prepared according to the formula of Rogosa et al, J. Bact., 62; 132 (1951).

The media described by Wickerham, J. Bact., 56; 363 (1948), for the classification of yeast according to morphology, nitrogen assimilation, carbon assimilation and vitamin requirements are available in dehydrated from as Bacto-Yeast Morphology Agar, Bacto-Yeast Nitrogen Base, Bacto-Yeast Carbon Base and Bacto-Vitamin Free Yeast Base.

XII. University of Pennsylvania, Philadelphia 4, Department of Dermatology and Department of Microbiology.

Communicated by Dr. Edward D. De Lamater.

(Dr. De Lamater's group is engaged in a broad program of comparative cytology in microorganisms. For this reason a brief resumé of their work on bacteria and algae is also included. Editor)

Abraham Vidra and I are completing a study on the cytology of meiosis in Schizosaccharomyces octosporus, which will be presented first at the New York Academy of Science in an abbreviated form, and later at the SAB meetings. In this work it has been demonstrated that the Feulgen-positive body in the yeast cell constitutes the complete nucleus, and the chromosomal activity is limited to it. It has been possible to follow the details of the meiotic process with the creation of four chromosomes in this organism.

Comparable studies on the meiotic phenomena in Chlamydomonas are likewise being completed by Moselio Schaechter and myself. Our studies on the cytology of the nuclei of bacteria are continuing. Dr. Mary Elizabeth Hunter is completing studies on meiotic phenomena in Micrococcus cryophilus; and Edward Minsavage is completing studies with me on the effects of colchicine on the nuclear mechanisms of Salmonella typhosa.

I have been continuing studies on the effects of antibiotics and other C-mitotic substances on bacterial nuclei, and I am preparing a paper on our current concepts of the bacterial nucleus as it is derived from these studies.

XIII. University of California, Departments of Chemistry and Viticulture at Davis, California.

Communicated by Dr. J. G. B. Castor.

1. R. P. Kepner, J. G. B. Castor, and A. D. Webb, have investigated the appearance of n-propanol in commercial wine distillates. Failure to find α-amino-n-butyric acid in grape juice, raised the question as to the origin of the n-propanol. As a Corrollary, the ability of yeast to convert the amino acid to n-propanol was studied. Laboratory experiments showed that Saccharomyces cerevisiae var. ellipsoideus, can produce a small amount of n-propanol in the presence of added α-amino-n-butyric acid, under proliferating conditions, but not under non-proliferating conditions. The results suggest that an adaptive enzyme situation might be involved. This hypothesis is under study at present.

2. J.G.B. Castor and T. F. Archer, Department of Viticulture, University of California, Davis, are conducting a survey of certain species in all the genera of yeasts capable of fermenting appreciable amounts of invert sugar, under non-proliferating conditions. Large quantities of pure cultures of the yeasts are produced, washed, and heavy suspensions are added to a solution of invert sugar in an acid phosphate medium. Amounts of sugar used, production of ethanol, volatile esters, volatile acid and aldehydes are measured. In addition the range and types of odors and flavors are being assessed on a non-statistical basis by a small panel of experienced tasters. Results to date indicate that the final data will be of interest in view of the paucity of information presently available in the literature concerning yeasts other than varieties of Saccharomyces cerevisiae.

XIV. University of California, Department of Food Technology, Davis, California.

1. Dr. Emil M. Mrak, on sabbatical leave at present, is expected back in Davis in April. He has spent a month with Dr. Wickerham in Peoria and several months at M.I.T. with Dr. Proctor in the Department of Food Technology. On his way back he is planning to visit many other institutions.

2. Miss Marion Okimoto of the Hawaiian Pineapple Research Institute is spending several months in our Department. She is engaged in a project of identifying the yeasts most commonly associated with the spoilage of fresh pineapple.

3. Mrs. Elisa P. Knapp from the University of São Paulo, Brazil is spending a year in our laboratory under a Rockefeller Foundation Fellowship to study yeasts. She is particularly interested in the relationship between yeasts and Drosophila flies.

4. Mr. Moshe Shifrine, under the guidance of H. J. Phaff, has completed his Masters Thesis entitled "The Association of Yeasts with certain Bark Beetles." One hundred and fifty one isolates were obtained from Dendroctonus and Ips bark beetles collected from various Pinus species in California. The yeasts were isolated by the use of dissection

procedures from adults, callow-adults, pupae and larvae of the above mentioned beetles. Dr. Wickerham has kindly consented to review and compare some of the most common isolates with those isolated by him from insect frass from coniferous trees. Preliminary indications show that Dr. Wickerham's collection contains mating types for some of the imperfect yeasts obtained by us.

5. Mr. Arnold L. Demain and H. J. Phaff have continued their work on the exo-cellular yeast polygalacturonase of Saccharomyces fragilis. Work has been completed on the breakdown of the lower oligo-uronides by this enzyme system. We are now working on the purification of yeast polygalacturonase, using ammonium sulfate fractionation and electrophoretic analysis.

Mr. Demain expects to complete his Ph D dissertation in the near future and has accepted a position with Merck and Co. He plans to work on the biosynthesis of Penicillin at the Danville plant, Pennsylvania.

6. The following publications have appeared recently or are accepted for publication.

"Carotenoids in Asporogenous Yeasts" by T. Nakayama, G. Mackinney and H. J. Phaff. Antonie van Leeuwenhoek, Second issue(1954).

"Determination of Carbon Assimilation Patterns of Yeasts by Replica Plating" by M. Shifrine, H. J. Phaff and A. L. Demain, Jour. Bact. (in press).

"Properties of Yeast Polygalacturonase" by B. S. Luh and H. J. Phaff Archiv. Biochem. Biophys. 48, 23 (1954).

"End products and Mechanism of Hydrolysis of Pectin and Pectic Acid by Yeast Polygalacturonase (YPG)" by B. S. Luh and H. J. Phaff Archiv. Biochem. Biophys. (in press).

"The Preparation of Tetragalacturonic Acid" by A. L. Demain and H. J. Phaff, Archiv. Biochem. Biophys. (in press).