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Dear Dr. Blackburn:

My apologies for this delay in responding to your letter of February 18 requesting reprints or preprints of articles of mine dealing with telomeres. My studies of them relate to the behavior of newly broken ends of chromosomes. These studies commenced in the early 1930s and continued into the 1940s. Reprints of reports of these studies are long since exhausted. In those early days one did a thorough job before publishing. Thus, my articles are long and detailed--the type of article no one wants to read in this day of avalanching mini-reports. Enclosed is a red-marked list of publications relating to fusion of broken ends of chromatids (the chromatid type of breakage-fusion-bridge cycle) and of chromosomes (the chromosome type of breakage-fusion-bridge cycle). At least you will have received references to my studies of the behavior of borken ends of chromosomes, even though you may have no desire to examine these reports.

In brief the results are as follows. Ring chromosomes in maize undergo chromatid exchange. The rate of such exchange is proportional to the length of the DNA in the ring chromosome. This exchange results in a double-size, dicentric ring chromosome. Separation of the centromeres at anaphase produces two bridges, side-by-side. Each bridge is ruptured. A broken end from each bridge enters a telophase nucleus. The two newly broken ends then fuse, reestablishing a ring chromosome whose size and content depend on the position of rupture that had occurred in each strand. These fusions are <u>chromosomal</u>.

In my maize stocks <u>chromatid</u> fusions occur in gametophytic and endosperm tissues but not in sporophytic tissues. A chromosome ruptured at a meiotic anaphase will appear as a dicentric chromosome in the following gametophytic anaphase because of "fusions" during the

replication cycle that occur at the position of break during the previous anaphase. These anaphase bridges and breaks, with subsequent dicentric chromatid formations, continue in the gametophytic and endosperm mitoses. In the embryo, however, the broken end "heals". Because an anaphase bridge may be ruptured at many or any position between the two diverging centromeres, the capacity for "healing" must apply to many or any broken end. I have observed many chromosomes with a healed end. Healings took place all along the arm of a chromosome. Chromosomes having such a healed end have been propagated over many plant generations. Thus, the healing process provides a new telomere, as stable as any other.

During these studies I found a mutant whose effect was to eliminate the capacity of cells of the sporophyte to produce a telomere at a newly broken end. When a newly broken end was introduced into a zygote this end continued to undergo the chromatid type of breakage-fusion-bridge cycle, and in all mitoses throughout plant development. It would appear that this mutant affects the production or the action of an enzyme required for formation of new telomeres. I have no published report of this observation. The evidence was obtained incidentally in the course of another study. For purposes of publication, the study would need to be expanded and this I did not do. It is evident, however, that in my basic genetic stocks telomere-forming repair enzymes are not produced or made available to cells of the gametophyte and endosperm but are produced in embryonic cells.

Thank you for including the topics to be discussed in your chapter on Centromeres and Telomeres. I look forward to reading it when it appears.

Sincerely,

Barbara McClintock