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Subject: Original and Re-collections of *Polytrichum ohioense* and *Polytrichum pallidisetum* for Antitumor Screening

To: Whom It May Concern

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Polytrichum ohioense Ren. & Card. (Polytrichaceae) (Spjut 4357, HSC, ORE, US) was one of nine general samples of mosses collected for antitumor screening in 1976 (Spjut et al., 1986, 1988). A EtOH extract (B-819208) of this sample, 1-2 kg dried (PR-45770), exhibited confirmed activity in 9KB (NCI, 1977), but not in P388 Leukemia; re-collections requested by the National Cancer Institute required activity in the P388 system with T/C of $\geq 150\%$.

When significant P388 activity was discovered in another species of moss, *Claopodium crispifolium* (Hook.) Ren. & Card (Thuidiaceae) (NCI, 1980), this led to further collections of bryophytes; *Polytrichum ohioense* was re-collected in 1982 (Spjut 7421, US), 20 kg (PR-57189). The re-collection of *Polytrichum ohioense* (PR-57189) was conducted over a period of several months as a charitable contribution by Spjut. It represents one of the last re-collections recorded by the USDA for the NCI antitumor screening program; NCI terminated its cooperative agreement with the USDA in October 1982. Subsequent re-collections of *Polytrichum ohioense* include: Spjut 8323 (US)-9 kg (WBA-5); Spjut 8324 (US)-3 kg (WBA-6); Spjut 8323, 0.5 kg (WBA-15); Spjut 8334, 2 kg (WBA-16); Spjut 9316 (US), 3 kg (WBA-328); Spjut & Gilliland 11157 (US), Gilliland & Spjut 03-06 (US), 45 kg (WBA-986-990).

Polytrichum pallidisetum Funck is recognized by Crum and Anderson (1981), although other bryologists evidently include this under *Polytrichum ohioense*. The identification by Norris (Spjut et al., 1986) of *Polytrichum ohioense* (Spjut 6449, HSC, ORE, US, PR-54774) has been interpreted by Spjut to be *Polytrichum pallidisetum*. The extract (B-856807) of this sample was referred to as *Polytrichum ohioense* by Suffness when he assigned the re-collection (PR-57189) to Cassady. Re-collections of *P. pallidisetum* were recommended to Cassady by Spjut because P388 activity had been reported in *P. pallidisetum* [B-856807, Spjut 6449 (HSC, ORE, US), PR-54774], and it was considered a closely related species to the 9KB active-*P. ohioense* (B-819208, Spjut 4357, PR-45770); re-collections include Spjut 8353 of 2.5 kg (WBA-14), Spjut 10099 of 4 kg (WBA-455), and Spjut 10136 of 2 kg (WBA-456).

The distinction between *Polytrichum ohioense* and *Polytrichum pallidisetum* is based primarily on subtle differences of microscopic characters of the terminal cells of the lamellae that cover the upper surface of the leaf; however, these species show ecological differences. *P. ohioense* is found mostly in the lowland hardwood forests of the eastern United States and Europe (Crum and Anderson, 1981); *P. pallidisetum* occurs primarily in coniferous forests in northern latitudes, extending south into the mountainous areas of the southern Appalachian states. *P. pallidisetum* is also a slightly larger species than *P. ohioense*, and this difference is significant when making re-collections.

Polytrichum commune Hedw., a cosmopolitan species, is related to *Polytrichum*

ohioense and *P. pallidisetum*, but samples have shown little consistent activity (Spjut et al., 1986). Its taxonomy is also based on microscopic characteristics of the terminal lamellae cells. *P. commune* frequently occurs with *P. ohioense*, or *P. pallidisetum*, and the ability to recognize these species in the field had to be learned by repeated sampling and later microscopic examination; taxonomic characters given in floras (e.g., Crum and Anderson, 1981) are not useful to identify species of *Polytrichum* as seen in the field. *P. commune* is best recognized by the loose aggregation of plants that do not touch one another whereas the plants of *P. ohioense* and *P. pallidisetum* are crowded together to form cushions. *P. commune* is generally a much larger species, often associated with boggy habitats, but smaller forms often occur in dry habitats. Preliminary field studies on the ecological and gross morphological characteristics of Polytrichaceae spp. were primarily conducted during 1982-1984 (Spjut unpublished).

In the White Mountains National Forest of New England, *Polytrichastrum longisetum* (Sw. ex Brid.) Smith and *Polytrichastrum alpinum* (Hedw.) G. Smith may be mistaken for *Polytrichum pallidisetum*. As with other Polytrichaceae species, these species are difficult to recognize in the field with any degree of confidence. The best way to select for *P. pallidisetum* is to collect it in its preferred habitat, near shaded *Sphagnum* bogs in spruce-hemlock or fir forests. *Polytrichastrum alpinum* often occurs along the margins of rocky streams in montane coniferous forest, and *Polytrichastrum longisetum* is sometimes frequent along ridges and margins of trails. Several other species of *Polytrichum* are common in the White Mountains, *P. juniperinum*, and *P. piliferum*, but these can be recognized with a hand lens (lamellae covered by the incurving leaf margins) and habitat preference to exposed soil or soil over rocks, especially near the margins of forests. As indicated above, the gross taxonomic distinctions for *P. commune*, *P. ohioense* and *P. pallidisetum* are not discussed in floras, and it should be noted that the ecological preferences I have described for the Polytrichaceae species in the White Mountains may not necessarily apply to other geographic regions; for example, *Polytrichastrum alpinum*, occurs along the coast of Washington near sea level, but also at high elevations in the Mountains of the Pacific Northwest (Vitt. et al., 1988).

References

- Crum, H.A. and L.E. Anderson. 1981. Mosses of Eastern North America. 2 Vols. Columbia University Press, New York.
- National Cancer Institute. 1977, 1980. Cumulative active Plant and Animal Materials (CPAM Listings, unpublished).
- Spjut, R.W., M. Suffness, G.M. Cragg & D.H. Norris. 1986. Mosses, liverworts, and hornworts screened for antitumor agents. *Econ. Bot.* 40(3): 310-338.
- _____, J.M. Cassady, T. McCloud, M. Suffness, D.H. Norris, G. Cragg, & C.F. Edson. 1988. Variation in cytotoxicity and antitumor activity among samples of the moss *Claopodium crispifolium* (Thuidiaceae). *Econ. Bot.* 42(1): 62-72.
- Vitt, D.H., J.E. Marsh & R.B. Bovey. 1988. Mosses, lichens and ferns of Pacific Northwest North America. Lone Pine Publishing, Edmonton.