Fungal contamination in barley and Kashin-Beck disease in Tibet

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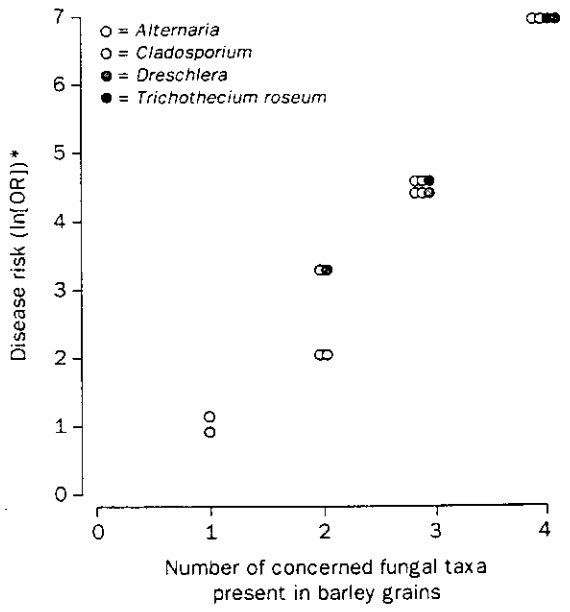
Kashin-Beck disease (KBD) is an endemic degenerative osteochondropathy estimated to affect some 1–3 million people in rural China.[1] Selenium deficiency, high concentration of organic matter in drinking water, and contamination of food by mycotoxins are the main hypotheses of the etiology of KBD.[1–3]

We carried out a community-based case-control study to test the hypothesis that KBD is related to fungal contamination of stored barley grain in the Tibet Autonomous Region. In October, 1995, post-harvest grain samples were obtained from 60 dwellings with 54 affected and 76 unaffected children aged 5 to 15 years old. Diagnosis of KBD in children was based on presence of joint pain, joint enlargement or deformation, and on loss of joint mobility. As observed in other regions, elbows, ankles and knees were the most frequently affected joints in our sample.[4] The percentage of fungal-contaminated grains was determined by direct plating method.[5] First results showed that mesophilic fungal contaminations were significantly higher on barley grains stored in families with KBD (median 66% of grains infected) than in healthy families (median 43% of grains infected) (Kruskal-Wallis $p<0·01$).

The risk of KBD associated with the presence of fungal taxa on barley grains was expressed in odds ratios (ORs), adjusted for age and sex and calculated with logistic regression. Three common fungal taxa in grains were significantly associated with KBD. *Trichothecium roseum* (Pers) Link ex Gray (OR16·37, $p<0·001$), *Dreschlera* Ito (OR8·75, $p<0·001$) and *Alternaria* Nees ex Fr (OR2·96, $p<0·001$). ORs adjusted for the presence of other fungi concerned showed an independent effect of each of these three taxa. However the effect of *Dreschlera* was significantly higher in presence of a fourth taxon. *Cladosporium* Link ex Fr, indicating an interaction ($p<0·05$).

Compared with the absence of fungi, the cumulative effect of different fungal associations can be estimated (figure).

On the basis of these results, we conclude that, in Tibet, there are two critical periods for fungal grain contamination related to KBD. First, during the growing season, from contaminated seeds (*Dreschlera*) or from contaminated debris of the preceding harvest (*Alternaria, Cladosporium*). Second, just after harvest, during the drying period in the field, especially when the daily difference of temperature is high (dewy grains) and consequently, at the beginning of the storage, when too moist grains are placed in bags or other containers (*Trichothecium roseum* and also *Alternaria* and *Cladosporium*).



Risk of Kashin-Beck disease in Tibetan children as function of fungal taxa in barley grains

As measures to prevent KBD in Tibet, we suggest disinfection of barley seeds, destruction of crop residues, and efficient grain drying before storage.

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Doses in family members after ^{131}I treatment

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The radiation dose received by 73 family members (35 partners and 38 children) of ^{131}I-treated patients for thyroid cancer after near-total thyroidectomy (n=22) or for thyrotoxicosis (18) were measured with LiF thermoluminescent dosimeters worn for 15–21 days. Because the radiation-weighting factor (W_R) is unity for ^{131}I, the absorbed doses (mGy) were converted into dose equivalents (mSv). The effective half-time of ^{131}I and the residual thyroid activity were measured with a gamma camera.

In the thyroid-cancer group, patients were in hospital for 2 days. After discharge, 11 of 19 couples adopted separate sleeping arrangements for 8 days and 7 of 10 children stayed away from home for the first 8 days after treatment. In all cases, the residual activity in thyroid remnants was less than 150 MBq 4 days after treatment and decayed with a mean half-time of 2·2 (SD 0·8) days. Median dose equivalent over 2 weeks was 0·17 mSv (range 0·02–0·49) for the partners with separate arrangements and 0·24 mSv (0·05–0·53) for the others. The median dose received by children was 0·08 mSv (0–0·35), with a maximum dose below 0·1 mSv in those children kept away from home for the first 8 days.

In the thyrotoxicosis group, patients were treated as outpatients. Five of 16 couples adopted separate sleeping arrangements. All 17 children kept their usual habits and stayed at home. Effective half-time averaged 6·2 days (1·2). Median dose over 3 weeks was 1·07 mSv (0·22–1·27) for the five couples with separate sleeping arrangements and 1·01 mSv (0·05–5·23) for the others. Median dose received by children was 0·13 mSv (0·04–3·12).