Excerpt from "Microchip-Induced Tumors in Laboratory Rodents and Dogs: A Review of the Literature 1990–2006"

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Le Calvez et al., 2006

Subcutaneous microchip-associated tumours in B6C3F1 mice: A retrospective study to attempt to determine their histogenesis. *Experimental and Toxicologic Pathology*. 2006;57:255—265.

Author(s)	# of Animals	Species	Study Length	Developed Cancer
Le Calvez et al., 2006	1,260	mice	2 years	4.1%

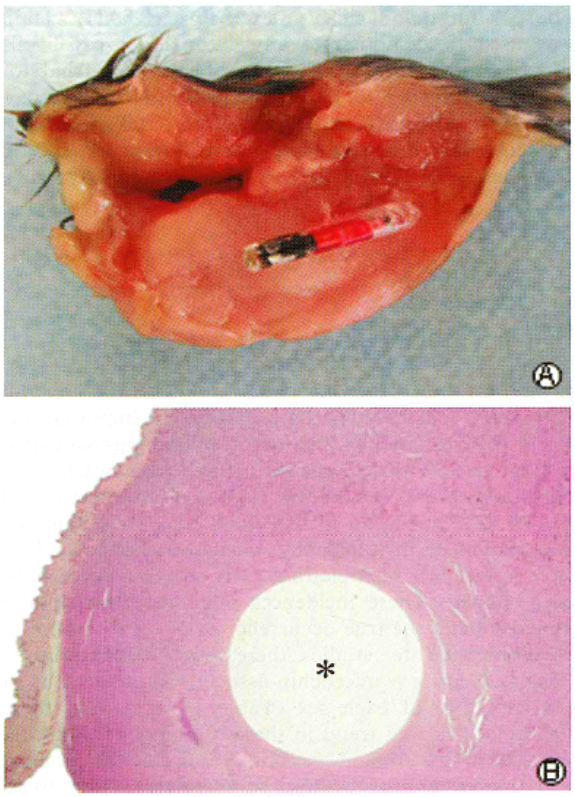

Fig. 1. Gross and microscopic appearance of a microchip-associated tumour. (A) The microchip has been removed from the cavity where it resided in situ (size of microchip 2 × 12 mm). (B) Cavity related to the removed microchip (asterisk) (H&E, × 25).

"Most of the animals with microchip-associated tumors died prematurely...due to the size of the masses [or] the deaths were spontaneous and attributed to the masses." (p. 258)

"One of the most potentially serious disadvantages of the microchip implantation is the possibility that foreign-body-induced tumours may develop..." (p. 256)

Summary of Study

Microchips were implanted into 1,260 experimental mice for identification purposes. Two years later, 4.1% of the mice had developed malignant (cancerous) tumors at the site of the microchip implantation. The cancers were directly attributed to the microchips. In one subgroup, the cancer rate among the chipped mice was 6.2%.

Study Design and Key Findings

1,260 mice were separated into groups for use in three oral carcinogenicity studies. The first study involved 550 mice, 110 of which received only a microchip implant. The other 440 received a microchip implant along with a low, medium, or high dose of a chemical test substance in their feed.

Two years later, 34 of the mice (6.2%) had developed malignant (cancerous) tumors around or adjacent to the microchip. These tumors occurred across groups, appearing in control mice as well as mice that had received the ingested chemical. Researchers plainly identified the microchip as the cause of the tumors.

The second study involved 600 mice. 120 received only a microchip, while the other 480 received a microchip combined with varying doses of a chemical compound in their feed. Two years later, 14 out of the 600 mice (2.3%) had developed cancerous tumors related to the microchip. For the test group

of 480 mice, these tumors were determined to be unrelated to the ingested compound.

In the third study, 110 mice were implanted with a microchip and received no other intervention. Four of these animals (3.6%) developed a tumor around the microchip.

The researchers suggest the actual cancer rate may have been higher than what they reported, as they tested for cancer only when visible abnormalities were seen in the mice. Smaller tumors in the early stages of development that were not yet visible to the naked eye may have been missed.[1]

Additional findings

- All of the cancerous masses found either contained the microchip or were adjacent to it. An empty capsule where the microchip had been was frequently identified as the origin of the tumor.[2] Figure 1 from the article (reproduced on the previous page) illustrates this phenomenon.

- Tumors were initially identified by morphology as fibrosarcoma (17 cases), rhabdomyosarcoma (12 cases), leiomyosarcoma (2 cases), malignant fibrous histiocytoma (3 cases), mammary gland adenocarcinoma (2 cases), and other sarcomas (16 cases). Researchers later redefined the tumors as "sarcomas not otherwise specified (NOS) with a large myofibroblastic component" (p. 255) after additional testing. A sarcoma is a malignant tumor of soft tissue that connects, supports or surrounds other structures and organs of the body.

- Once initiated, the tumors grew rapidly. Most of the animals that developed microchip-associated tumors died prematurely as a result of the tumors.

- Four microchip-related cancers metastasized (spread) to the lungs, liver, stomach or pancreas.

- Many of the implants migrated from the original implantation site on the back of the mice to cause cancer at other locations in the body. Nineteen percent of the cancers found involved microchips that had migrated from the back to the limbs, abdomen, or head of the mice.

- A test procedure known as desmin staining found that the tumors often infiltrated nearby muscle tissue and that there was "an extensive cavernous network of capillaries within the tumour, especially around the hole left by the microchip." (p. 261)

Study Details

- The study was conducted at MDS Pharma Services in L'Arbresle, France.

- Animals used in the study were B6C3F1 mice from Charles River Laboratory.

- Microchip implants were from BioMedic Data Systems Inc. and were described as

1 The authors write that "as these were only sampled and examined histologically when gross abnormalities were noted, it is possible that early reaction could have been missed. These incidences may therefore slightly underestimate the true occurrence." (p. 258)

2 The researchers wrote: "All sarcomas were characterized by a poorly delineated, non-encapsulated, densely cellular mass, located in the subcutis but frequently infiltrating the panniculus muscle and various layers of the skin with occasional ulcerations. A round-to-oval empty space of 2 mm diameter corresponding to the cast of the microchip was frequently seen and associated with a vestigial fibrous capsule and/or a focus of necrosis." (p. 261)

"hermetically sealed in a cylindrical inert glass capsule measuring 12 mm in length and 2 mm in diameter and partially covered on a length of 5 mm by a porous polypropylene polymer sheath as an antimigration measure." (p. 255)
