RESEARCH ANIMALS

# Not even good rats

## Too much may have been bred out of white rats for reliable research

by Barbara J. Culliton

*Laboratory rats are less typical genetically than their wild cousins.*

*Tree shrews may make better research animals, until they, too, are overbred.*

When the house of Hanover sailed from Germany to England in 1714, its ship transported rats as well as kings. The rats, pugnacious east Asian natives dubbed Norway rats or *Rattus norvegicus,* soon after became the dominant strain in Europe, displacing the common black rat which is probably the strain the Pied Piper led out of Hamelin 430 years earlier.

By 1822, when rat baiting was a popular sport in England and France, albino forms of the brown *norvegicus* appeared and were often rescued from the baiting pits by collectors and breeders.

Though the precise origin of these white rats is unknown, records show they were being used experimentally in Paris by 1856, thus beginning their climb to supremacy in the scientific world.

By the early 1900's psychologist John B. Watson was running white rats through mazes, building the theories of behavior and learning that held dominion over psychology for 40 years, and the rats' position in research was, and virtually still is, assured.

**Only now** is the white rat's role as chief guinea pig for psychology being challenged, not directly by psychologists but by psychologists with a strong background in biology.

Dr. Robert B. Lockard of the University of Washington in Seattle contends that the white rat, somewhat randomly selected for learning studies in the first place, has become so transformed by generations of captivity that it is not only not a human being, as common extrapolations from animal studies might suggest, but is not even a very good rat.

It is certainly unlike the wild Norway from which it sprung. The wild animal is pugnacious, the domestic mild; the wild is afraid of man, the laboratory breed is not. The white rat is 20 percent fatter than its now distant cousin, but its brain, thyroid and adrenal glands weigh less.

"It is possible," Dr. Lockard suggests, "that the white rat is an anomalous freak. We don't know how it has degenerated genetically. Research with it is risky, particularly psychological research."

**Animals,** Dr. Lockard observes, are the results of certain combinations of genes from the gene pool of the population. Differences among species exist because gene pools differ. In the same way, strains of the same species differ because they do not share the same pool, even though some genes may be held in common. At this point, he contends, white rats have very little in common genetically with wild Norways and very little in common with any other animal. "They are, in fact, man-made animals that never existed before."

And that is critical, even to behavior studies.

"Theoretically every gene may contribute to some degree of behavioral variance," says Dr. John L. Fuller, a behavioral geneticist at the Jackson

## . . . white rats

Laboratories in Bar Harbor, Maine. Just as certain genes are associated with fur color or bone structure, other genes can be associated with behavior and learning. If an animal loses the need to behave or learn in certain ways, within a few generations the genes originally responsible for that behavior —such as fighting or nest building— could be weakened or lost.

Psychologists studying learning in white rats, Dr. Lockard declares, ignore the genetic determinants involved, favoring the belief that learning differences are due to "emotional factors, mere physical differences, or sometimes to parameters or constants in equations." In addition, he charges them with seeing learning as a single process, a completely general mechanism that operates roughly the same way in one species as in another. Learning should be viewed, he says, as a complex of processes related to the animals' adaptive needs.

Many birds, for example, are unable to recognize their young once they leave the nest. While they need their parents' care, they stay put, and once gone, never return, so there is no need for recognition. Certain young birds, however, including some types of song birds and gulls, are out hopping about before they can fend for themselves. Their parents have an adaptive ability to learn to recognize them.

**After generations** in captivity, white rats no longer have any adaptive need of learning the kinds of things necessary for survival in the wild, and their genetic make-up is changed. Shelter, food and sex are so built into the environment, even an idiot rat could flourish. "Therefore, even if rat learning were completely analyzed, the result might be quite incomplete, lacking aspects normally occurring in animals," Dr. Lockard believes.

Dr. J. Lee Kavanau, a zoologist at the University of California at Los Angeles, agrees. Captivity severely limits an animal's natural desire to control its environment and its response to behavioral tests is markedly distorted, he explains. The first response of a wild animal in captivity is a rebellious attempt to control the environment irrespective of conditions. For example, if an experimenter periodically turns a light off, even a nocturnal animal will turn it on and sleep all night with it on.

**Highly inbred** animals, such as white rats, are so conditioned to captivity that it is not always reasonable to judge their behavior as in any way typical. "For many physiological studies it is desirable to work with these highly inbred animals," Dr. Kavanau says. "But when highly inbred strains are used for behavioral studies, the behavior may have only limited significance for the species as a whole and could even be quite misleading."

Dr. Lockard states his challenge directly. "If the white rat is unsuitable or unique or misleading, so are many of the products of psychology." He proposes comparative studies of wild Norway rats and the white domesticated strains to see just how different they are and in what ways. "Fortunately, the issue at hand is not the impossible task of a complete genetic analysis, but is an estimate of how unique the white rat has become in matters of behavior and related sensory, endocrine, and nervous system function."

**A recent** grant proposal on this subject was turned down. "I had no trouble getting support for research before, but this is a very unpopular proposal. I learned unofficially that biologists reviewing the proposal were favorable but psychologists were not."

Dr. Lockard frankly admits that his own views on white rats are a minority report, but says that having stated his case, he has received from colleagues almost as much approval as he has rebuke.

He proposes several alternative research approaches. In answer to critics who say that white rats are valuable because their genetic similarity permits those who are interested to observe genetic determinants, he says that the commercially bred rats that psychologists buy are often not truly inbred, in the defined sense of coming from more than 20 brother-sister matings, and therefore are unsuitable for such work. More careful attention to breeding would solve that problem.

**Better approaches,** however, would be through study of learning in much simpler organisms, including earthworms, fish or frogs. Simpler forms with simpler mechanisms would be more likely to yield to analysis in psychology just as simple microbes yield to the analyses that lead geneticists to DNA (deoxyribonucleic acid). Use of mammals closer to man in the evolutionary tree also makes good sense, he suggests, naming the tree shrew as a good model —good for 10 or 20 years, that is, until domesticated shrews would be as unnatural as domesticated rats.

Better still would be paying greater attention to a variety of animals. "The approaches mentioned above presume the current strategy of focusing resources on a single animal. Regardless of the species chosen, this approach risks mistaking the particular for the general." Psychologists, Dr. Lockard contends, have done that long enough. ◇