

noise according to its interference with a television program they are watching and according to the annoyance they feel at the noise.

David C. Glass, a psychologist at New York University and Jerome E. Singer of the State University of New York at Stony Brook have conducted laboratory experiments on behavioral effects of noise. They exposed the subjects to noise of varying intensity and regularity. Their research confirmed previous findings that noise per se has minimal effect on task performance. "Laboratory-produced noise does not affect the subject's ability to do mental and psychomotor tasks ranging from the boringly simple to the interesting and creative."

But exposure to noise may have serious aftereffects and the degree seems to depend on the subject's aversion to the noise. Intermittent noise was found to be more aversive than continuous noise and had a correspondingly greater effect on the subject's subsequent ability to perform complex tasks and to tolerate frustrations. When the noise was presented at irregular intervals so that it was unpredictable from the subject's viewpoint, it did not degrade performance of simple tasks unless the subject was working at maximum capacity. In such a case, say the researchers, the noise apparently produces a mental overload and information processing is inhibited.

All their findings, they say, "underscore the importance of cognitive factors in mediating the effects of noise on behavior."

In another test, subjects were told that if they pressed a button, the noise would stop. This perception of control over the noise had a dramatic effect on aftereffects: post-noise tolerance of frustration and quality of task performance both increased substantially. These results suggest, they say, that perception of control reduces the aversive impact of unpredictable noise—the subject's feeling of helplessness—and so also reduces the deleterious aftereffects. □

## How hormones act on cells

Now that quite a lot is known about the general action of various hormones and about physiological activities within cells, biologists are beginning to figure out how hormones might work at or within particular target cells. There is a good reason to believe that protein hormones do not enter the target cell, perhaps because they are too big to get through the cell membrane. But there is concrete evidence that some smaller steroid hormones are able to get into the target cell and very possibly exert their influence directly

on the chromosomes inside the cell.

Because chromosomes from the salivary glands of fruit flies are especially easy to see under the microscope, biologists have used these insects' salivary gland tissue to see how steroid hormones might affect chromosomes. Puffy rises can be seen in salivary gland chromosomes at certain times in the fruit flies' development. These rises are believed to represent gene action—production of protein by DNA, perhaps. Each puff could well represent a gene site, but this has not been proven. About a decade ago, researchers showed that the fruit fly molting hormone, ecdysone, can induce puffing in salivary gland chromosomes. Hans Laufer of the University of Connecticut reported at the meeting of AAAS that he has recently observed that juvenile hormone induces chromosome puffing as well.

Juvenile hormone keeps the fruit fly young until it is ready to mature. The hormone is neither a steroid nor a protein, but a lipid. Laufer says he does not know whether the hormone actually enters the cell. It may somehow work on the chromosomes from

## The drugged Americans: Aspirin-poppers not spared

It is hardly news that there is a flagrant overuse of prescription and nonprescription drugs in the United States and that this overuse has largely contributed to the over-all drug abuse problem with marijuana, LSD, heroin, pep pills and what have you. At the AAAS meeting a physician, a pharmacist and a health economist spelled out particulars of the indictment.

As an example of abuse of prescription drugs, Charlotte Muller, health economist at the City University of New York and a member of the Mayor's committee on amphetamine abuse, pointed to amphetamine consumption. Studies, she asserted, show that amphetamines do not help weight reduction very much, yet many physicians continue to prescribe them.

Prescription drug sales are \$4 billion annually, but nonprescription drugs also come to a fat \$2.4 billion. One of the reasons for this overuse, says Richard Penna of the American Pharmaceutical Association, is that people view nonprescription medications like other items of commerce. They think nonprescription drugs are harmless and are watched over by "some ill-defined but potent forces in Washington."

Although there is no proof that overuse of medications has turned youth to pill-popping, considerable evidence indicates that an overmedicated society has been influential in this direction, Muller and Penna agree. Muller says

outside of the cell wall.

The Connecticut biologist also described work he had done to get a better idea of how ecdysone and juvenile hormone might influence puffing or gene activation. He initially reasoned that because the two hormones act more or less sequentially in the life of the fly, they may act in opposition to each other on the same chromosome puffs, or genes. But under manipulated laboratory conditions, he found that the hormones can exert biological activity simultaneously on the living fruit fly. The fly can produce egg yolk protein by action of ecdysone, for example, while juvenile hormone at the same time prevents the fly from growing up normally. Laufer concluded that because the hormones can work in concert, they probably exert their effects on different chromosome puffs or genes, rather than on the same ones. In subsequent tissue experiments on salivary gland tissue he showed that ecdysone and juvenile hormone indeed exert selective responses among chromosome puffs. He also found that some puffs were not affected by either hormone. □

that once amphetamines get into the family medicine cabinet, they "soften up receptivity" to drugs among youngsters. Some parents have gone so far as to give amphetamines to restless children. (Although amphetamines are stimulants for adults, they tend to calm children down.)

Don Luria, chairman of the department of preventive medicine at the New Jersey Medical College and chairman of the New Jersey State Council on Drug Addiction, said a study of 12,000 youngsters in New Jersey showed that escalation of drug use among youth—from marijuana, say, to LSD (the usual pattern)—is definitely related to dosage. Youngsters who use pot less than once a month, for example, have less than a 4 percent chance of turning to LSD. Once-a-month users have a 10 percent chance. Weekly users have a 22 percent chance. Luria said he has no doubt that parental drug behavior has created an attitude of drug indulgence among these youths, but no studies have yet made a conclusive link.

In discussing incitements to drug overuse, the speakers came down particularly hard on the drug companies and their advertising. Penna said that television ads for nonprescription drugs have created tremendous pressure for purchase. Many ads, he declared, "create diseases where none exist," and then offer remedies that may not work

for the complaints they conjure up.

Muller indicted physicians too. Studies have shown, she said, that physicians often prescribe drugs to terminate a patient interview and to get on with the next patient. More physicians, she said, should follow the example of Richard Feinbloom of Harvard in trying to reduce prescriptions of psychotropic drugs by spending more time with patients who have emotional problems. Some 23 percent of all prescribed drugs are for psychological conditions.

The hospitals, Muller said, also contribute to the overmedication problem by sedating and soothing. It keeps patients quiet.

In spite of the difficulties of getting sundry implicated parties to accept their responsibility in dealing with drug overuse, the speakers offered some suggestions in this direction. The public, Penna asserted, should ask whether drug advertising is in its best interest. Perhaps a semi-government board, under the auspices of the National Academy of Sciences, might be given legal authority to review all drug ads before they are released to the public. [It is interesting to note that the American Medical Association House of Delegates discussed a resolution to clamp down on television drug advertising at their last convention but did not pass it.]

Some physicians, Muller said, are more willing to limit drug prescribing than others. Several local medical societies have set guidelines on prescribing, and Muller suggested other societies might follow their example.

The pharmacist, Penna said, might take nonprescription drugs that he feels are dangerous off his counter and dispense them to customers at his discretion. Many nonprescription drugs have as serious side effects as prescription drugs, Penna declared. Even the supposedly innocuous aspirin can cause gastric bleeding and seriously interact with anticoagulants.

As far as the public is concerned, the speakers tended to agree, that education may be part of the answer to drug overuse. The New Jersey Study of Youth and Drugs, for example, showed that youths in one community restrained from drug abuse because of "fear of mental damage"; in another community it was because of "fear of the law." We should also keep in mind, Muller said, that "you do not get rid of something unless you replace it with something else." The New Jersey study, Luria reported, shows drug use among New Jersey youths has reached a plateau in the past two years. He strongly believes that some of these youths might have found a replacement for drugs. It may be a return to good old sex, or participation in the "back to Jesus movement," he says. □

## Prenatal sex hormone levels: A possible link to intelligence

Most neuroendocrinologists agree that prenatal hormones influence future behavior in some way. John W. Money at Johns Hopkins School of Medicine in Baltimore believes that high levels of fetal sex hormone may be a direct cause of increased intelligence. His report of this possible relationship, in the December *IMPACT OF SCIENCE ON SOCIETY*, stems from research into the effects of having excess androgen (male sex hormone) before birth.

An excess of androgen during prenatal life can be produced by a genetic malfunction of the adrenal cortex, the outer three layers of the adrenal gland. The adrenal cortex fails to synthesize cortisone and secretes in its place a precursor hormone that acts biologically like an androgen. In the female fetus this causes the external genitalia to differentiate into their masculine counterparts. In the male fetus it leaves no visible mark, but the newborn infant loses large amounts of salt. In both male and female infants the androgen excess produces premature signs of puberty. Since 1950, however, both salt loss and premature puberty have been treated and controlled by cortisone therapy.

Thus, since 1950, a generation of affected children has grown up unencumbered by postnatal androgen excess. It is these individuals Money has been studying. And it is among these individuals that he has found a high proportion with high IQ's. In an ordinary population 2.2 percent have an IQ of 130 or higher. In the excess-androgen group 12.9 percent have an IQ of more than 130 in both verbal and performance tests.

The group Money tested consisted of 70 males and females, but due to lack of funds he has not been able to contact and test a larger sampling (including siblings and parents of the affected individuals). And further tests, he says, are necessary to confirm his findings.

Related research, however, has helped to confirm Money's beliefs. He investigated a syndrome resulting from ex-

posure of the fetus to progestin (a synthetic form of progesterone, the female sex hormone that prepares the womb to receive the fertilized egg). In the past progestin was given to pregnant women to prevent threatened miscarriages. A side effect was that the external genitalia of the female fetuses were sometimes partially and occasionally completely masculinized.

This particular drug is no longer used but Money has been able to contact and test 10 females who were victims of the progestin-induced hermaphroditism. Six of the ten girls tested had IQ's above 130 and none had an IQ below 100. Here again there is a possibility that the findings may be unique and, "only an accumulation of more cases will be able to settle the issue," says Money.

Response to Money's findings has been low key, he says, because not enough researchers are into this particular field. But he is in touch with scientists in Tel Aviv and Holland who are working along similar lines. And the senior investigator in the endocrinology department at the Institute of Obstetrics and Gynecology in Leningrad has been working with patients suffering from the adrenogenital syndrome. He reports they have reached a higher than average educational status.

Money has no idea how the sex hormones operate in relation to intelligence but he feels they must work directly on the brain in some way. And if they do there are many possible implications. For instance, could it be that an investigation of some forms of mental deficiency would reveal a correlation with low or nonexistent levels of sex hormones at a critical period? Would a woman who knows there is a high possibility that she will give birth to a mentally retarded child consent to progestin therapy that might help the unborn child? "We are far from knowing the answers to these questions," admits Money, "but the possibilities for further research look particularly exciting." □

IQ level	Expected percentage	Observed percentage	Expected number	Observed number	Expected cumulative percentage	Observed cumulative percentage
130 or more	2.2	<i>12.9<sup>1</sup></i>	1.5	9	2.2	<i>12.9</i>
120-129	6.7	<i>18.6</i>	5.0	13	8.9	<i>31.5</i>
110-119	16.1	<i>28.6</i>	11.0	20	25.0	<i>60.1</i>
100-109	25.0	12.8	17.5	9	50.0	72.9
90-99	25.0	14.3	17.5	10	75.0	87.2
80-89	16.1	4.3	11.0	3	91.1	91.5
70-79	6.7	7.1	5.0	5	97.8	98.6
69 or less	2.2	1.4	1.5	1	100.0	100.0

1. Figures in italics show increased incidence of IQs above 110.

*Observed versus expected frequencies of IQ of seventy adrenogenital subjects.*