

Science News in Review

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Process of Dying

Lessons of Some Experiments In Resuscitation

At last week's congress of American-Soviet Friendship the Soviet-American Medical Society created a sensation by exhibiting a film which came from Moscow and in which a dog was resuscitated after having been declared dead. To physicians the revelations of the film were not exactly new. Ever since 1925 they had been reading in the medical press accounts of the remarkable work done by Dr. Serge Bryukhonenko. At the congress the latest resuscitation technique was projected on the screen, with a sound-track commentary in English by Professor J. E. S. Haldane.

Bryukhonenko is no mere trickster bent on making the multitude gasp. He wants to shed light on the process of dying. To approach this goal it becomes necessary to use an artificial heart and artificial lungs outside the body. The necessary apparatus is called an "autojector," which is essentially a blood pump and a "lung."

One part of the autojector is connected with an artery of a dog killed by draining its blood and the second part with a vein. As everybody knows, arteries carry oxygenated blood in the living body, and the veins blood from which oxygen has been taken and which goes back to the lungs for replenishment.

Driven By Pump

The autojector has a vessel in which dog's blood is artificially oxygenated and which serves as an artificial lung. A pump drives this oxygenated blood through the arterial system of the dead dog. Another pump, connected with a vein, takes the blood from the venous system and sends it back to the artificial "lung" to be reoxygenated. The circulatory system of the living organism is therefore duplicated.

At last week's meeting of the Soviet-American Medical Society spectators saw on the screen a dead dog, thus treated, slowly revive. Closed eyes responded to light. An electrocardiograph left no doubt that the heart was beginning to beat again. The beats were translated into sound, so that the steady thump, thump of the reviving heart could be heard. When the rhythm was normal the apparatus was disconnected and the heart kept on beating spontaneously. Three days later (according to the film) the dog was frisking about and eating. Three such dogs have been kept alive and in normal health since 1939.

The same method can be applied to keep individual organs alive. The film shows how a heart can be kept alive and beating outside the body. In fact, that is how Bryukhonenko began his researches.

This department first heard of the work back in 1929 after he had been experimenting for four years. It was then his practice to chloroform a dog and inject an anticoagulant to prevent clotting of blood. Whereupon the lungs were blocked off and the blood drained into a primitive autojector. Bryukhonenko then cut off the dog's head but took the utmost care to leave blood vessels and nerves intact. As a result, the head was connected with the body of the dog by only four large neck arteries and some nerves. Nevertheless, there were signs of life.

The Final Decapitation

Next came the crucial step of final decapitation. Bryukhonenko connected the tubes of his apparatus with some of the blood vessels. Thereupon the apparatus was started. The artificial heart began to beat and the blood to circulate through the head and to reinforce the dog's heart. Bryukhonenko then severed the remaining blood vessels and connected them with the apparatus. Signs of life could be observed despite this drastic procedure.

The dog's fully severed head, now lying on a plate, was properly connected with the apparatus. To observers it seemed as if the head were merely asleep. The eyes were closed and there was no movement. The blood could be seen flowing in the tubes. As it entered the head it was bright red because it had been oxygenated in the apparatus; as it flowed back to the

apparatus it was purplish. The difference in color testified to the fact that the blood was utilized in the normal way.

Though the head was motionless, it was not dead. The reason was that the anesthetic had been renewed. When the eye was touched it twitched. After twenty minutes there were more signs of life. The eyes were open by that time and looked alive. The head responded to a whole series of stimuli. Eyelids blinked when hairs on the brow were plucked. Particularly noticeable was the response when the mucous membrane of the nose was irritated. In fact, it was often necessary to hold the head on to the plate by main force. The muzzle was opened and the teeth were bared in a snarl. When quinine was placed on the tongue there was every sign of repugnance. Pieces of sausage and cheese were swallowed and ejected through the top of the alimentary canal. In short, the head behaved just as if it were attached to the body. And in this condition it remained for about three and a half hours.

Human Experiment

Bryukhonenko kept on experimenting and steadily perfected his apparatus until it assumed the form of the autojector shown on the screen last week. In October, 1934, he told Harold Denny, Moscow correspondent of this paper, that he had actually succeeded in briefly bringing back to life a man who had committed suicide and who had been adjudged dead three hours. The dead man was resuscitated for only two minutes after the blood started circulating again, but in that interval he breathed, opened his eyes and appeared to look at the doctors clustered about him. This was the only partially successful experiment of the kind that Bryukhonenko had performed up to that time. For all we know he may have had more striking successes in his experiments since.

What is the significance of all this? Let Bryukhonenko speak:

"Every death is only apparent death in the first stage. Not until some time has elapsed is resuscitation impossible. We now have the means of studying the metabolism of the central nervous system, so that we may hope to answer such questions as these: How is the brain nourished? What products are discharged by the brain into the blood stream when it is at work and when it is fatigued?"

Probably there are other consequences. The day may not be far off when operations now incompatible with life may be performed—operations such as the repairing of the heart or brain and the restoration of the victims of shock and hemorrhage.