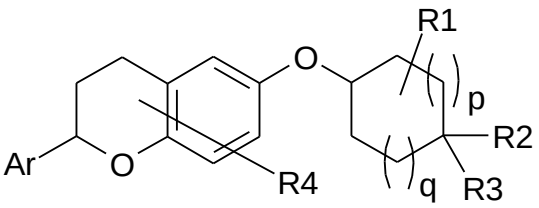
Claims

1. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof,



I

wherein

Ar is phenyl which is unsubstituted or substituted by one or more identical or different substituents R0;

R0 is selected from the series consisting of halogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-, HO-, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O- and (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-O-, and two groups R0 bonded to adjacent ring carbon atoms in Ar, together with the carbon atoms carrying them, can form a 5-membered to 7-membered mono-unsaturated ring which comprises 0, 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

R1 is hydrogen or one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

R2 is selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, HO-, (C_1-C_6)-alkyl-O-, (C_1-C_6)-alkyl-C(O)-O-, phenyl-C(O)-O-, Het1-C(O)-O-, R5-N(R6)-, R7-C(O)-N(R8)-, R7-$S(O)_2$-N(R8)-, R9-N(R10)-C(O)-N(R8)- and R5-N(R6)-C(O)-, wherein (C_1-

C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20;

R3 is selected from the series consisting of hydrogen and (C_1-C_6)-alkyl, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or two identical or different substituents selected from the series consisting of (C_3-C_7)-cycloalkyl, phenyl, HO- and (C_1-C_4)-alkyl-O-;

or the groups R2 and R3 together are oxo;

R4 is hydrogen or one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-;

R5 and R6 are independently of one another selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_3-C_7)-cycloalkyl, (C_6-C_{10})-bicycloalkyl, phenyl, Het1 and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl, (C_6-C_{10})-bicycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21, and phenyl and Het1 all are unsubstituted or substituted by one or more identical or different substituents R22,

or the groups R5 and R6, together with the nitrogen atom carrying them, form a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which, in addition to the nitrogen atom carrying R5 and R6, comprises 0 or 1 further ring heteroatom selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R21;

R7 is selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, phenyl, Het1 and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21,

and phenyl and Het1 all are unsubstituted or substituted by one or more identical or different substituents R22;

R8 is selected from the series consisting of hydrogen and $(C_1$-$C_4)$-alkyl;

R9 is selected from the series consisting of $(C_1$-$C_6)$-alkyl, $(C_3$-$C_7)$-cycloalkyl, $(C_3$-$C_7)$-cycloalkyl-$(C_1$-$C_4)$-alkyl-, phenyl-$(C_1$-$C_4)$-alkyl- and Het1-$(C_1$-$C_4)$-alkyl-;

R10 is selected from the series consisting of hydrogen, $(C_1$-$C_6)$-alkyl, $(C_3$-$C_7)$-cycloalkyl, $(C_3$-$C_7)$-cycloalkyl-$(C_1$-$C_4)$-alkyl-, phenyl-$(C_1$-$C_4)$-alkyl- and Het1-$(C_1$-$C_4)$-alkyl-;

R20 is selected from the series consisting of R24, fluorine, HO-, oxo, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, R30-C(O)-O-, R30-NH-C(O)-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(HO)_2P(O)$-O-CH_2-O-C(O)-O-, $(C_1$-$C_6)$-alkyl-$S(O)_n$-, $(C_3$-$C_7)$-cycloalkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, $(C_1$-$C_6)$-alkyl-$S(O)_2$-N(R32)-, R31-N(R32)-C(O)-, R34-O-C(O)- and R31-N(R32)-$S(O)_2$-;

R21 is selected from the series consisting of $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, R31-N(R32)-$(C_1$-$C_4)$-alkyl-, R34-O-C(O)-$(C_1$-$C_4)$-alkyl-, R24, fluorine, HO-, oxo, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, R30-C(O)-O-, R30-NH-C(O)-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(HO)_2P(O)$-O-CH_2-O-C(O)-O-, $(C_1$-$C_6)$-alkyl-$S(O)_n$-, $(C_3$-$C_7)$-cycloalkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, $(C_1$-$C_6)$-alkyl-$S(O)_2$-N(R32)-, R31-N(R32)-C(O)-, R34-O-C(O)- and R31-N(R32)-$S(O)_2$-;

R22 is selected from the series consisting of halogen, $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, $(C_3$-$C_7)$-cycloalkyl, HO-, oxo, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(HO)_2P(O)$-O-CH_2-O-C(O)-O-, $(C_1$-$C_6)$-alkyl-$S(O)_n$-, $(C_3$-$C_7)$-cycloalkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, R33-O-C(O)-N(R32)-, $(C_1$-$C_6)$-alkyl-$S(O)_2$-N(R32)-, NC-, R33-C(O)-, R31-N(R32)-C(O)-, R34-O-C(O)- and R31-N(R32)-$S(O)_2$-;

R24 is a 3-membered to 10-membered, monocyclic or bicyclic ring which is saturated, partially unsaturated or aromatic and comprises 0, 1, 2, 3 or 4 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R22;

R30 and R33 are independently of one another selected from the series consisting of $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl, $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-, phenyl-$(C_1\text{-}C_4)$-alkyl- and Het1-$(C_1\text{-}C_4)$-alkyl-;

R31 and R32 are independently of one another selected from the series consisting of hydrogen, $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl, $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-, phenyl-$(C_1\text{-}C_4)$-alkyl- and Het1-$(C_1\text{-}C_4)$-alkyl-,

or the groups R31 and R32, together with the nitrogen atom carrying them, form a 4-membered to 7-membered, monocyclic saturated heterocycle which, in addition to the nitrogen atom carrying R31 and R32, comprises 0 or 1 further ring heteroatom selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and $(C_1\text{-}C_4)$-alkyl;

R34 is selected from the series consisting of hydrogen, $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl, $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-, phenyl-$(C_1\text{-}C_4)$-alkyl- and Het1-$(C_1\text{-}C_4)$-alkyl-;

Het1 is a 5-membered or 6-membered, monocyclic, aromatic heterocycle which comprises 1, 2 or 3 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of halogen, $(C_1\text{-}C_4)$-alkyl and $(C_1\text{-}C_4)$-alkyl-O-, unless specified otherwise;

Het2 is a 4-membered to 10-membered, monocyclic or bicyclic, saturated or partially unsaturated heterocycle which comprises 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur;

n is selected from the series consisting of 0, 1 and 2, wherein all numbers n are independent of one another;

p and q are independently of one another selected from the series consisting of 0 and 1;

wherein all phenyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-, unless specified otherwise;

wherein all cycloalkyl and bicycloalkyl groups, independently of any other substituents which can be present on a cycloalkyl or bicycloalkyl group, can be substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

2. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to claim 1, wherein

Ar is phenyl which is unsubstituted or substituted by one or more identical or different substituents R0;

R0 is selected from the series consisting of halogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-, HO-, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O- and (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-O;

R1 is hydrogen or one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

R2 is selected from the series consisting of (C_1-C_6)-alkyl, HO-, (C_1-C_6)-alkyl-O-, (C_1-C_6)-alkyl-C(O)-O-, Het1-C(O)-O-, R5-N(R6)-, R7-C(O)-N(R8)-, R7-S(O)$_2$-N(R8)-, R9-N(R10)-C(O)-N(R8)- and R5-N(R6)-C(O)-, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20;

R3 is selected from the series consisting of hydrogen and (C_1-C_6)-alkyl, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or two identical or different substituents selected from the series consisting of (C_3-C_7)-cycloalkyl and phenyl;

or the groups R2 and R3 together are oxo;

R4 is hydrogen or one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-;

R5 and R6 are independently of one another selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, (C_2-C_6)-alkenyl, (C_3-C_7)-cycloalkyl, Het1 and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21, and Het1 is unsubstituted or substituted by one or more identical or different substituents R22,

or the groups R5 and R6, together with the nitrogen atom carrying them, form a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which, in addition to the nitrogen atom carrying R5 and R6, comprises 0 or 1 further ring heteroatom selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R21;

R7 is selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, phenyl, Het1 and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21, and phenyl and Het1 all are unsubstituted or substituted by one or more identical or different substituents R22;

R8 is selected from the series consisting of hydrogen and (C_1-C_4)-alkyl;

R9 is selected from the series consisting of (C_1-C_6)-alkyl and (C_3-C_7)-cycloalkyl;

R10 is selected from the series consisting of hydrogen, (C_1-C_6)-alkyl and (C_3-C_7)-cycloalkyl;

R20 is selected from the series consisting of R24, fluorine, HO-, oxo, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O-, R30-C(O)-O-, R30-NH-C(O)-O-, HO-S(O)$_2$-O-, (HO)$_2$P(O)-O-, (HO)$_2$P(O)-O-CH_2-O-C(O)-O-, (C_1-C_6)-alkyl-S(O)$_n$-, (C_3-C_7)-cycloalkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, (C_1-C_6)-alkyl-S(O)$_2$-N(R32)-, R31-N(R32)-C(O)-, R34-O-C(O)- and R31-N(R32)-S(O)$_2$-;

R21 is selected from the series consisting of (C_1-C_4)-alkyl, HO-(C_1-C_4)-alkyl-, R31-N(R32)-(C_1-C_4)-alkyl-, R34-O-C(O)-(C_1-C_4)-alkyl-, R24, fluorine, HO-, oxo, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O-, R30-C(O)-O-, R30-NH-C(O)-O-, HO-S(O)$_2$-O-, (HO)$_2$P(O)-O-, (C_1-C_6)-alkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, (C_1-C_6)-alkyl-S(O)$_2$-N(R32)- and R31-N(R32)-C(O)-;

R22 is selected from the series consisting of halogen, (C_1-C_4)-alkyl, HO-(C_1-C_4)-alkyl-, (C_3-C_7)-cycloalkyl, HO-, oxo, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O-, HO-S(O)$_2$-O-, (HO)$_2$P(O)-O-, (C_1-C_6)-alkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, R33-O-C(O)-N(R32)-, (C_1-C_6)-alkyl-S(O)$_2$-N(R32)-, NC-, R33-C(O)- and R31-N(R32)-C(O)-;

R24 is a 3-membered to 7-membered, monocyclic ring which is saturated, partially unsaturated or aromatic and comprises 0, 1, 2 or 3 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R22;

R30 and R33 are independently of one another selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-, phenyl-(C_1-C_4)-alkyl- and Het1-(C_1-C_4)-alkyl-;

R31 and R32 are independently of one another selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-, phenyl-(C_1-C_4)-alkyl- and Het1-(C_1-C_4)-alkyl-;

R34 is selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl and (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-;

Het1 is a 5-membered or 6-membered, monocyclic, aromatic heterocycle which comprises 1, 2 or 3 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-, unless specified otherwise;

Het2 is a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which comprises 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur;

n is selected from the series consisting of 0, 1 and 2, wherein all numbers n are independent of one another;

p and q are independently of one another selected from the series consisting of 0 and 1;

wherein all phenyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-, unless specified otherwise;

wherein all cycloalkyl groups, independently of any other substituents which can be present on a cycloalkyl group, can be substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

3. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 and 2, wherein

Ar is phenyl which is unsubstituted or substituted by one or more identical or different substituents R0;

R0 is selected from the series consisting of halogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-, HO-, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O- and (C_3-C_7)-cycloalkyl-(C_1-C_4)-alkyl-O-;

R1 is hydrogen or one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

R2 is selected from the series consisting of (C_1-C_6)-alkyl, HO-, (C_1-C_6)-alkyl-O-, R5-N(R6)-, R7-C(O)-N(R8)-, R9-N(R10)-C(O)-N(R8)- and R5-N(R6)-C(O)-, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20;

R3 is selected from the series consisting of hydrogen and (C_1-C_6)-alkyl, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or two identical or different substituents selected from the series consisting of (C_3-C_7)-cycloalkyl and phenyl;

or the groups R2 and R3 together are oxo;

R4 is hydrogen or one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-;

R5 and R6 are independently of one another selected from the series consisting of hydrogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21,

or the groups R5 and R6, together with the nitrogen atom carrying them, form a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which, in addition to the nitrogen atom carrying R5 and R6, comprises 0 or 1 further ring heteroatom selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R21;

R7 is selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21;

R8 is selected from the series consisting of hydrogen and (C_1-C_4)-alkyl;

R9 is selected from the series consisting of (C_1-C_6)-alkyl and (C_3-C_7)-cycloalkyl;

R10 is selected from the series consisting of hydrogen, $(C_1\text{-}C_6)$-alkyl and $(C_3\text{-}C_7)$-cycloalkyl-;

R20 is selected from the series consisting of R24, fluorine, HO-, oxo, $(C_1\text{-}C_6)$-alkyl-O-, $(C_3\text{-}C_7)$-cycloalkyl-O-, R30-C(O)-O-, R30-NH-C(O)-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(C_1\text{-}C_6)$-alkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, $(C_1\text{-}C_6)$-alkyl-$S(O)_2$-N(R32)-, R31-N(R32)-C(O)-, R34-O-C(O)- and R31-N(R32)-$S(O)_2$-;

R21 is selected from the series consisting of $(C_1\text{-}C_4)$-alkyl, HO-$(C_1\text{-}C_4)$-alkyl-, R31-N(R32)-$(C_1\text{-}C_4)$-alkyl-, R34-O-C(O)-$(C_1\text{-}C_4)$-alkyl-, R24, fluorine, HO-, $(C_1\text{-}C_6)$-alkyl-O-, $(C_3\text{-}C_7)$-cycloalkyl-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(C_1\text{-}C_6)$-alkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)- and R31-N(R32)-C(O)-;

R22 is selected from the series consisting of halogen, $(C_1\text{-}C_4)$-alkyl, HO-$(C_1\text{-}C_4)$-alkyl-, $(C_3\text{-}C_7)$-cycloalkyl, HO-, $(C_1\text{-}C_6)$-alkyl-O-, $(C_3\text{-}C_7)$-cycloalkyl-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(C_1\text{-}C_6)$-alkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, NC-, R33-C(O)- and R31-N(R32)-C(O)-;

R24 is a 3-membered to 7-membered, monocyclic ring which is saturated, partially unsaturated or aromatic and comprises 0, 1, 2 or 3 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R22;

R30 and R33 are independently of one another selected from the series consisting of $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl and $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-;

R31 and R32 are independently of one another selected from the series consisting of hydrogen, $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl and $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-;

R34 is selected from the series consisting of hydrogen, $(C_1\text{-}C_6)$-alkyl, $(C_3\text{-}C_7)$-cycloalkyl and $(C_3\text{-}C_7)$-cycloalkyl-$(C_1\text{-}C_4)$-alkyl-;

Het2 is a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which comprises 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur;

n is selected from the series consisting of 0, 1 and 2, wherein all numbers n are independent of one another;

p and q are independently of one another selected from the series consisting of 0 and 1;

wherein all phenyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of halogen, (C_1-C_4)-alkyl and (C_1-C_4)-alkyl-O-, unless specified otherwise;

wherein all cycloalkyl groups, independently of any other substituents which can be present on a cycloalkyl group, can be substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

4. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 3,

Ar is phenyl which is unsubstituted or substituted by one or more identical or different substituents R0;

R0 is selected from the series consisting of halogen, (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl, (C_1-C_6)-alkyl-O- and (C_3-C_7)-cycloalkyl-O-;

R1 is hydrogen or one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

R2 is selected from the series consisting of (C_1-C_6)-alkyl, HO-, R5-N(R6)-, R7-C(O)-N(R8)- and R5-N(R6)-C(O)-, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20;

R3 is hydrogen;

R4 is hydrogen or one or more identical or different substituents selected from the series consisting of halogen and (C_1-C_4)-alkyl;

one of the groups R5 and R6 is selected from the series consisting of hydrogen and (C_1-C_6)-alkyl, and the other of the groups R5 and R6 is selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl and Het2, wherein (C_1-C_6)-alkyl all are unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21;

R7 is selected from the series consisting of (C_1-C_6)-alkyl, (C_3-C_7)-cycloalkyl and Het2, wherein (C_1-C_6)-alkyl is unsubstituted or substituted by one or more identical or different substituents R20, and (C_3-C_7)-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21;

R8 is selected from the series consisting of hydrogen and (C_1-C_4)-alkyl;

R20 is selected from the series consisting of R24, fluorine, HO-, (C_1-C_6)-alkyl-O-, (C_3-C_7)-cycloalkyl-O-, HO-S(O)$_2$-O-, (HO)$_2$P(O)-O-, (C_1-C_6)-alkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, (C_1-C_6)-alkyl-S(O)$_2$-N(R32)-, R31-N(R32)-C(O)- and R31-N(R32)-S(O)$_2$-;

R21 is selected from the series consisting of $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, R31-N(R32)-$(C_1$-$C_4)$-alkyl-, fluorine, HO-, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, R31-N(R32)-, R33-C(O)-N(R32)- and R31-N(R32)-C(O)-;

R22 is selected from the series consisting of halogen, $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, $(C_3$-$C_7)$-cycloalkyl, HO-, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-$S(O)_2$-O-, $(HO)_2P(O)$-O-, $(C_1$-$C_6)$-alkyl-$S(O)_n$-, R31-N(R32)-, R33-C(O)-N(R32)- and R31-N(R32)-C(O)-;

R24 is a 3-membered to 7-membered, monocyclic ring which is saturated, partially unsaturated or aromatic and comprises 0, 1, 2 or 3 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R22;

R33 is selected from the series consisting of $(C_1$-$C_6)$-alkyl;

R31 and R32 are independently of one another selected from the series consisting of hydrogen, $(C_1$-$C_6)$-alkyl, $(C_3$-$C_7)$-cycloalkyl and $(C_3$-$C_7)$-cycloalkyl-$(C_1$-$C_4)$-alkyl-;

Het2 is a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which comprises 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur;

n is selected from the series consisting of 0, 1 and 2, wherein all numbers n are independent of one another;

p and q are 1;

wherein all cycloalkyl groups, independently of any other substituents which can be present on a cycloalkyl group, can be substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

5. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 4, wherein R2 is selected from the series consisting of R5-N(R6)- and R7-C(O)-N(R8)-.

6. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 4, wherein R2 is R5-N(R6)-C(O)-.

7. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 6, wherein R3 is hydrogen.

8. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 4, 6 and 7, wherein

Ar is phenyl which is unsubstituted or substituted by one or two identical or different substituents R0;

R0 is selected from the series consisting of halogen, (C_1-C_6)-alkyl and (C_1-C_6)-alkyl-O-;

R1 is hydrogen;

R2 is R5-N(R6)-C(O)-;

R3 is hydrogen;

R4 is hydrogen;

one of the groups R5 and R6 is selected from the series consisting of hydrogen and $(C_1$-$C_6)$-alkyl, and the other of the groups R5 and R6 is selected from the series consisting of $(C_1$-$C_6)$-alkyl, $(C_3$-$C_7)$-cycloalkyl and Het2, wherein $(C_1$-$C_6)$-alkyl all are unsubstituted or substituted by one or more identical or different substituents R20, and $(C_3$-$C_7)$-cycloalkyl and Het2 all are unsubstituted or substituted by one or more identical or different substituents R21;

R20 is selected from the series consisting of R24, fluorine, HO-, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-S(O)$_2$-O-, $(HO)_2$P(O)-O-, $(C_1$-$C_6)$-alkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)-, $(C_1$-$C_6)$-alkyl-S(O)$_2$-N(R32)- and R31-N(R32)-C(O)-;

R21 is selected from the series consisting of $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, R31-N(R32)-$(C_1$-$C_4)$-alkyl-, fluorine, HO-, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-S(O)$_2$-O-, $(HO)_2$P(O)-O-, R31-N(R32)-, R33-C(O)-N(R32)- and R31-N(R32)-C(O)-;

R22 is selected from the series consisting of halogen, $(C_1$-$C_4)$-alkyl, HO-$(C_1$-$C_4)$-alkyl-, $(C_3$-$C_7)$-cycloalkyl, HO-, $(C_1$-$C_6)$-alkyl-O-, $(C_3$-$C_7)$-cycloalkyl-O-, HO-S(O)$_2$-O-, $(HO)_2$P(O)-O-, $(C_1$-$C_6)$-alkyl-S(O)$_n$-, R31-N(R32)-, R33-C(O)-N(R32)- and R31-N(R32)-C(O)-;

R24 is a 3-membered to 7-membered, monocyclic ring which is saturated, partially unsaturated or aromatic and comprises 0, 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur, and which is unsubstituted or substituted by one or more identical or different substituents R22;

R33 is selected from the series consisting of (C_1-C_6)-alkyl;

R31 and R32 are independently of one another selected from the series consisting of hydrogen and (C_1-C_6)-alkyl;

Het2 is a 4-membered to 7-membered, monocyclic, saturated or partially unsaturated heterocycle which comprises 1 or 2 identical or different ring heteroatoms selected from the series consisting of nitrogen, oxygen and sulfur;

n is selected from the series consisting of 0, 1 and 2, wherein all numbers n are independent of one another;

p and q are 1;

wherein all cycloalkyl groups independently of any other substituents which can be present on a cycloalkyl, can be substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C_1-C_4)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

9. A compound of the formula I according to any of claims 1 to 8, which is selected from the series consisting of:
trans-4-(2-o-Tolyl-chroman-6-yloxy)-cyclohexylamine,
N-(Isoxazol-5-ylmethyl)-4-(2-o-tolyl-chroman-6-yloxy)-cyclohexanecarboxamide,
2-Amino-N-[trans-4-((S)-2-phenyl-chroman-6-yloxy)-cyclohexyl]-acetamide,
4-(2-o-Tolyl-chroman-6-yloxy)-N-(1,3,5-trimethylpyrazol-4-ylmethyl)-cyclohexylamine,
(S)-N-[trans-4-(2-Phenyl-chroman-6-yloxy)-cyclohexyl]-pyrrolidine-2-carboxamide,
trans-4-((R)-2-o-tolyl-chroman-6-yloxy)-cyclohexanecarboxylic acid (2-hydroxy-ethyl)-amide,

trans-4-((S)-2-o-tolyl-chroman-6-yloxy)-cyclohexanecarboxylic acid (2-hydroxy-ethyl)-amide,
cis-4-((R)-2-o-tolyl-chroman-6-yloxy)-cyclohexanecarboxylic acid (2-hydroxy-ethyl)-amide,
cis-4-((S)-2-o-tolyl-chroman-6-yloxy)-cyclohexanecarboxylic acid (2-hydroxy-ethyl)-amide, and
Phosphoric acid mono-(2-{[trans-4-((S)-2-o-tolyl-chroman-6-yloxy)-cyclohexanecarbonyl]-amino}-ethyl) ester disodium salt,
or a pharmaceutically acceptable salt thereof.

10. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 9, for use as a pharmaceutical.

11. A pharmaceutical composition, comprising a compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 9, and a pharmaceutically acceptable carrier.

12. A compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 9, for use as an inhibitor of the sodium-calcium-exchanger (NCX) or in the treatment of heart failure, cardiac arrhythmias, stroke, dementia, hypertension, cardiac ischemia, or renal failure.

13. Use of a compound of the formula I, in any of its stereoisomeric forms or a mixture of stereoisomeric forms in any ratio, or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 9, for the manufacture of a medicament for the inhibition of the sodium-calcium-exchanger (NCX) or for the treatment of heart failure, cardiac arrhythmias, stroke, dementia, hypertension, cardiac ischemia, or renal failure.